All India Oriental Conference
Centenary Celebration Publication Series - **24**

Applications of Indian Logic and Atomism

by

Late Dr. N.R. Waradpande

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राष्ट्रहिताय संस्कृतम्

Kavikulaguru Kalidas Sanskrit University,
Ramtek

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PREFACE

It is indeed a matter of great pleasure and pride for Kavikulaguru Kalidas Sanskrit University, Ramtek to have this rarest opportunity of hosting the 50th session of All India Oriental Conference at Nagpur. This AIOC-50th session at Nagpur will be forever remembered by all as the year 2019 also happens to be the year of Centenary Celebration of AIOC. The premier objective with which the great scholars of yester years had contemplated and established this national academic event called All India Oriental Conference has been achieved through these years with scores of young scholars contributing significantly to the treasure house of knowledge through their valuable research work.

The research of yore and of the present should be properly recorded so as to make it easily available to all lovers of knowledge and wisdom in the years to come. With this objective, we have contemplated to commemorate the 100th year of this grand event of 50th session of AIOC by way of publishing 100 monographs on different subjects in four languages viz., Sanskrit, Hindi, Marathi and English. It is no doubt a herculean task but still worth of it, for the reason that these 100 monographs will inspire many young scholars to take upon a fresh study and research of the oriental subjects with more vigour and zeal.

The AIOC Centenary Publication Series includes wide variety of subjects like Literature, Language, Veda, Indian Philosophy, Sanskrit Grammar, Law, Children Literature, Yoga, Astronomy and Astrology, Ayurveda, Pali, Prakrit, Jain, Buddhism, Education, Library Science, Poetics, Aesthetics, and Indology. It also includes reprint of some rare texts of academic importance which have gone out of print are not easily available. We wish to mark this centenary celebrations with this series that connects the glory of the past and aspirations of future. I place on record my sincere gratitude to all the authors of these monographs who have kindly contributed to the richness of this

series.

I am confident that the books published in these series will definitely inspire the lovers of Oriental Learning in general and of Sanskrit Language and Literature in particular.

On this occasion, we have published a memorable book of all the speeches of Section-Presidents of all previous sessions of AIOC. It is indeed a very capacious addition to any collection. I with all respect thank two eminent scholars of our times - Prof. Gautam Patel, President and Prof. Saroja Bhate, General Secretary, the torch bearers of AIOC who have not only encouraged us in this venture but also made all efforts to provide these valuable historical speeches for us. I thank all executive members of AIOC and my colleagues of the varsity for making this event a grand success.

My words fall short in describing the painstaking efforts and scholarly commitment of my esteemed colleague Prof. Madhusudan Penna, local secretary of this session in bringing out this series.

I also take this opportunity to profusely thank Shri. Subhash Jain and Shri Dipak Jain, the proprietors of New Bharatiya Book Corporation, New Delhi for their enthusiastic approach and timely work with all precision and grace.

Let us all sanctify ourselves in the eternal flow of wisdom by reading these books and recommending these to others also!

सरस्वती श्रुतिमहती महीयताम्

Ramtek
10th January 2020

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Vice Chancellor, KKSU

Kavikulaguru Kalidas Sanskrit University
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100th Year 50th Session
10th-12th January, 2020

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Applications of
Indian Logic and Atomism

Logic and Language

Indian Logic starts from ***Gowtama***. Gowtama is mentioned in the Avesta as a specialist in debate. The Avesta according to Macdonell is 500 years later than the Rgveda. The lower limit of the date of the Rgveda is 3000 B.C. So this Gowtama could very well be the Gowtama, the husband of Ahalya mentioned in the Ramayana. This does not mean that he was a contemporary of Rama because the Ramayana mentions Buddha and even the Greeks. Bhasa the famous playwright who flourished sometime in the third century B.C. mentions Medhatithi as the author of Nyaya. We know from the Mahabhaarata that Medhatithi is the same as Gowtama. According to the Vayupurana, Gowtama was living in the Prabhasateertha in Sowrashtra. But since the name Gowtama appears in the Avesta, he is more likely to belong to Gandhara. The work of Gowtama is called Nyayadarshana. The word Nyaya is formed as 'nii' prefix meaning strictly+ 'aaya' causal from 'ay' standing for 'go' thereby meaning 'strictly bringing out'. So the net meaning of the word Nyaya is 'bringing out strictly from the data whatever it can justifiably yield'.

This Nyayadarshana has a correlative Darshana called Vaisheshika. The Vaisheshikas are those who believe in completely specific entities which have nothing in common with any other entity. The Vaisheshika Darshana is the correlate of the Nyayadarshana because it defines the seven primary categories of Indian Logic, which are 1. द्रव्य,

Substance 2. गुण, Quality 3. कर्म, Activity 4. सामान्य, Commonness 5. विशेष, Specificity 6. समवाय, Inherence and 7. अभाव Negation. But Kanada is best known for his atomism.

Kanada , the exponent of the Vaisheshika system, is well known in legends as a thorough atheist. When on deathbed his wife asked him to chant the name of God, he muttered 'atoms... atoms'.

It should be noted that no God is mentioned anywhere in the sootras of Gowtama either.

Legend has it that Kanada like the Peshava Bajeerao during campaigns, lived on raw grain picked up directly from the standing crops. Hence the name Kanada: *eater of particles*.

Kanada is also called Aulookya or the son of an owl. It should be noted that animals and birds were not held in contempt in ancient India and men and women could be named after them. Aulook was also the name of a tribe in Gandhara i.e. Afganistan. So, Kanada also like Gowtama could be from Gandhara.

In this connection it is pertinent to note that there is a reason to believe that Panini and Chanakya are also likely to have hailed from Gandhar.

Kanada was pre-Buddha because Ashvaghosha credits Buddha of correcting the mistakes of Kanada. This correction consisted in holding that the atoms are not inert matter but instants of time. Kanada flourished before Buddha but certainly after Gowtama.

The third landmark in the history of Indian Logic is ***Gangesha***. He flourished in the 13th century. He is reported to be one of those savants who took refuge in Bengal when Nalanda was ravaged by the invaders. He was not the only one to suffer this

fate and so this latest phase of Indian Logic grew predominantly in Bengal.

Gangeshaa, takes only one sootra from Gowtama viz. that *perception, inference analogy and testimony are the sources of knowledge* and wrote extensively on these four topics. This work is called ***Tattvachintamani*** or the gem of principles. His approach consists of defining rigorously the basic concepts of Logic.

After Gangeshaa comes ***Raghunatha***, He has written a commentary named ***Didhiti*** on the Tatvachintamani. Though this is a commentary, Raghunath claims that he says things which are at considerable variance with others including the work he comments upon. He has a reputation almost equal to that of Gangesha,

Gadadhara in the 17th century was the last in this line. Gadadhara has commented on the *Didhiti* more thoroughly than others and could be said to have broken new ground in Indian Logic. His commentary is called ***Gadadhari.***

This line from Gangesha to Gadadhara is called ***NavyaNyaya*** or New Logic. Thereafter Bengal was occupied by the British in the 18 th century and English education killed all indigenous developments. NvyaNyaya is the last contribution of India to world thought.

Sanskrit and English as media for Logic

Mountain is fireful is the famous statement in Indian Logic. On reading it the reader accustomed to reading English will say "this is wrong English. What does the sentence mean? *the mountain is fireful*? or a mountain is fireful? How can you use a noun without an article? Again you may as well say a man is wifeful instead of saying a man has a wife.

This English stalwart has to be told that this example in Indian Logic illustrates certain Logical principles. They cannot be

illustrated if you insist on English grammar and English idiom. The statement: Mountain is fireful states that fireful is a predicate of the mountain whereas your grammatically correct English statement states that there is a spatial relation between the mountain and the fire. So the two statements do not mean the same thing.

If *fireful* is a predicate of the mountain we can reason *The mountain is fireful*, whatever is fireful is heatful, therefore this mountain is heatful

But from the statement there is fire on the mountain the following reasoning does not follow:

There is fire on the mountain. Fire on the mountain is a relation. Therefore, the mountain is a relation.

Again *the mountain is fireful* means a definitely specified mountain is fireful. But I may not want to specify a particular mountain as fireful. When Charley Chaplin said' *I am at peace with God, my quarrel is with man*,' he was not specifying any particular man nor was he saying that his quarrel was with all men. Inserting any article definite or indefinite will misconstrue Chaplin's statement.

The statement: *x is wifeful jars* more than the statement. Mountain is fireful, but logically it has to be allowed for the same considerations. In fact, like the statement Mountain is fireful, it is actually used in Sanskrit The famous statement goes

Rama considered himself wifeful for being chosen by glory

कलत्रवन्तमात्मानं मेने संवरणच्छ्रिया ।

The statement *there is fire on the mountain* can be rendered in Sanskrit as:

parvate wahnih (पर्वते वह्निः)

Non-predicative propositions

There is fire on the mountain can be expressed as *the mountain is fireful* and *Rama has a wife* can be expressed as *Rama is wifeful* in Sanskrit but the proposition *Himalayais to the north of the Vindhya* cannot be expresed as *Hamalaya is north Vindhya*. This would mean *Himalaya is the northern part of Vindhya*. If we dissolve the compound *vindhyottara* as *vindhyasya uttarah*. But the correct dissolution would be *vindyasya uttare* which brings us back to the *north of vindhya*.

Laxmana is the brother in law of Seeta can be expressed as *Laxmano seetadevarah* i.e. Laxmana is Seeta's brother- in-law. But then the compound has to be dissolved as *seetayah devarah* which brings us back to the relational statement the *brother in law of Seeta* expressed by the possessive case.

The compound in the above expressions is a short hand for a relational statement and does not amount to a subject predicate statement.

So we have to look for a subject predicate statement without having resort to a compound. In: *The mountain is fireful* we have such a statement because *fireful* is not a compound.

So all statements cannot be reduced to subject predicate statements. Raghunatha says that there are statements which speak of relations and which are non-locus relations. *To the north* is a non locus relation because when x is to the north of y we cannot say that either x or y possess Northness or is northful. In the statement *Laxman is a brother in law of Seeta,* brother in law can be predicated of Laxmana but in *x is to the north of y*, north cannot be predicated of either x or y.

The verb "is "

Take the proposition: *Snakes are reptiles*. Here the verb "are" is in the present tense and in plural number. Both these are irrelevant for logic. It is not intended to say that the snakes are

reptiles today but may or may not have been so yesterday or will or will not be so tomorrow. Secondly the plural is also redundant for logic because it is not intended to deny that one snake is not one reptile.

In Sanskrit, it will simply be said *sarpah sareesrup*ah without a verb. The nominative singular is not for individual snakes and individual reptiles but for their jati (class) to use the term employed in grammar; the rule being that a singular expresses the unity of the jati of the snakes and not neccessarily one individual snake and one individual reptile and not the number of the snakes and the reptiles.

The word 'jati' however is restricted in Nyaya to classes which do not intersect. Logic cannot be restricted to such classes. So we restrict ourselves to samanya i.e., universals

The word '*are'* and the other derivatives of *'is'* also indicate existence. This causes many confusions in logic which are serious. Take the following example:

All golden mountains are golden.
All golden mountains are mountains.
Therefore, some mountains are golden.

The premises cannot be denied. That golden mountains are golden and that they are mountains follows from the description golden mountain. But still the conclusion cannot be accepted because no mountains are golden.

Russell solves this difficulty by saying that for drawing the inference: *some mountains are golden*; we need an additional premise that there are golden mountains. Does this mean that the word *"are"* in *"some mountains are golden"* does not stand for existence? How is this to be known?

Russell further says that *"golden mountain"* is a description but from the fact that x is a description it does not follow that x exists because the predicate existence does not belong to descriptions. If x answering to a description does not exist, we

say the statement x is a golden mountain is false for all values of x.*"Is "*can be used for x because x is not a description.

It is not necessary to take recourse to this if we follow the Sanskrit usage which regards the use of the verb "is" indicating existence not necessary. Sanskrit usage is: *Golden mountain golden* and *Golden mountain mountain* therefore, mountain, golden This expression does not affirm that the golden, mountain exists *(sauvarnaparvato sowvarnah, suvarnaparvato parvataha parvath sowvarnah).* There is no *"is"* in the following well known statements such as *vedah apourusheyah* (the Vedas are divine), *brahma satym jaganmithya jeevo brahmaiva naparah* (The brahma is true and the world a myth) and life is brahman and naught else etc.

The Order of words in English

Another example of how Sanskrit is nearer to Logic than English is that the order of words in English is indispensable for understanding a sentence. This order is determined by the order of their utterance. On paper this order is represented by spatial order: right/ left or up/down.

The objection of Logic to this is that this order does not convey any information. The action: *Rama goes to school*, does not occur hi the order in which the words are uttered nor have *Ram, going and school* have any order apart from a grammatical order of the words *Rama, going and school*.

The case and verbal inflections in Sanskrit on the other hand convey information. The nominative of Rama by itself conveys that Rama is the subject of action; the verbal inflection in gachchati conveys that an action in third person singular and present tense are indicated and the accusative of shala indicates that it is the object of action in the third person singular. This property is possessed only by the verb in English, in this case the verb goes. In other words, Rama and

school owe their meaning altogether to their position in the order, an order that has no informative justification.

This can lead to fallacies of the following type:

Rama goes to school but *the school never goes to Rama.It is only the inferior that goes to the superior,*

the superior never goes to the inferior.

Therefore, Rama is inferior to the school.

Sanskrit is immune from this fallacy because there is no order relation between the nominative and accusative, the proposition the school does not go to Ram is based on theinformation that the school is a building which cannot go, not by any information conveyed by the accusative. Inference aught to be based on the interrelations conveyed in the propositions and not any extra information provided by observation. Some may think that order cannot be ignored in Algebraical reasoning and therefore it is not correct to say that grammatical order does not convey information. A-B is not the same as B-A.

It should be noted that this is the fault of the notation. A-B should in fact be expressed as AB, Then AB and BA conveys the same meaning. Similarly, the divisionsign should be placed above the divider. This only means that division is an asymmetrical relation. One of the terms bears the relation and the other term is that in reference to which it does so. This is expressed in Nyaya by the words 'nishtha' and 'niroopita'. Thus the classes or propositions do not have any order in themselves independent of the relations they bear. The same class and the same proposition can have different relations in different contexts. So a fixed order of words in a language has no logical justification.

On this I was once confronted with the order of integers which it was claimed is inherent. But the order of integers is got only

by prescribing the first term and the relation + 1 for the next. The order is given by the interrelation of the classes and propositions and this can vary with the relation.

The Redundant Subject

The English expression *'it rains'* deserves notice. The subject it does not signify anything that is the subject of the verb rains, the statement seeks to emphasize rain and not the sky or the clouds. Sanskrit in such situations would use the passive voice and say *vrshyate*. The active voice *varshati* will emphasize the subject. Verbs in English have no active and passive forms, they have to be expressed by the word *by*.

Another class of expression is:*'There is no nector,'"There are no ghosts'* etc. Here though the pronoun there refers to a location the statement does not intend to deny a location of nectar or ghosts, it wants to deny them altogether. Another equivalent expression is ghosts or nectar do not exist.

This expression has a parallel in Sanskrit in *amritam nasti* etc. The believers in the existence of Ghosts etc are called astikas and the non believers, nastikas The termination *ka*at the end of the word Astika etc., may indicate *belonging to* as in the case of *aayodhyakah*.(Belonging to ayodhya). But in the case of *aastika*, the sense as *belonging to asti* makes no sense, because in that case *belonging to nasti* would mean *belonging to not or nothing*.lt would be more in keeping with Logic if we take the termination *ka* to stand for *kathayanti* as referring to those who say. So astikas are those who say that there is a God and nastikas are those who say there is none. Logic can have no objection to saying that there are such people.

It has already been shown by Russell that the verb exists cannot have a subject.

Verb is called *kriyapada* in Sanskrit, *kriyapada* means an expression indicating action. So even though the verb *is* indicates existence, it does so by indicating action. So A exists

means A acts, it has effects, the world will not be the same with and without A. The same applies to the verb *asti*. *Asti* is a kriyapada so *tat asti* means *that acts*.

Sanskrit has another expression *amrutam na vidyate* for *nectar does not exist*. The verb *vid* primarily stands for cognizing. In *vidyate* it is used in passive voice. This means in objective cognitions the object plays a primary role in cognition and the subject secondary. When subject plays a primary role the cognition is primarily subjective and when the object plays the primary role the cognition is primarily objective. So zero subjectivity is the lower limit of subjectivity and a cognition can be called fully'objective if it has zero subjectivity. It is only those objects which are cognized by zero subjectivity that can be called completely objective and can be deservedly described by the passive verb vidyate. So *amrutan na vidyate* primarily means a *perfectly objective cognition of nectar is not possible*.

The obvious objection to this is that a cognition in which the cogniser has no role to play is impossible. A full discussion of this point will carry us beyond the limits of this paper. Here it should suffice to say that the zero role of cognition refers to the zero role of unverifiable cognition. This has to be treated as a limit and not as an exact value.

It is worth noting in this respect that some schools in Indian philosophy define existence as *arthakriyakaritva*. This means capacity to produce objects and initiate actions.

Logic cannot assume that every activity has a subject. When there is a storm, Logic does not assume that the verb storm implies somebody who storms. The same mindset thinks that if the world was created there must have been a creator.

The Limitations of Nyaya

The subject-predicate form seems to have harmed the progress of Indian Logic. The warning of Raghunath that relational

statements should be made by mentioning the relevant relation expressly was not taken seriously. Almost all the examples of arguments which are discussed are in subject- predicate form.

This has harmed the development of Indian Logic. Raghunathah"s warning that in a relational statement the relation should be specifically mentioned has not been taken seriously. So in the present form Indian Logic is not applicable to relational and prepositional inferences.

Take the following proposition as an example.

Time is cowful. (कालः गोमान्)

What does this mean?

Cow is timeful will have some meaning as against space is timeless. But, what can *time is cowful* mean? Time has cow relations? There are no cow relations because the cow unlike Time is not known by its relations We can at best say Time relations have cow as a referent. In Sanskrit this will be expressed as: The relations referred to time reside in the cow. This does not mean time is cowful but cow is timeful.

I do not see what purpose is served by the expression: *Time is cowful*, I do not think that such a proposition can occur in any context that is intended as a piece of reasoning.

Another defect is that almost all the examples of arguments are based on the specific tenets of Nyaya. Almost no example excepting the famous fire and smoke is taken from everyday life. Surely there were courts in the days of Vatsyayana) (l00BC.) and Vachaspati (500 A.D) if not in the days of Kanada and Gowtama. But not a single argument used in courts has been discussed.

I requested Narayanshastri Dravid who was qualified to talk both on Nyaya as well as modern Logic to take up arguments in Copi'ss Logic and see how Nyaya can deal with them. He replied that this is too easy to need any demonstration, I said I

do not find this easy. I then picked up an argument from Copi and requested him to treat it in the Nyaya way for my benefit. He gave the same reply saying "asking such difficulties is not expected of you, of all persons".

I then approached Laxman shastri Joshi, He also did not care to take up the examples in Copi. Instead he gave a lecture on the fallacies enumerated in Nyaya.

I am here trying to imagine what Raghunath would have said about it. In one respect Nyaya is more akin to Boolean Algebra than to Aristotelian Logic.lt does not use quantifiers like Aristotle, it treats the *variables of Logic as classes* like Boolean Algebra.

But Boolean Algebra has gone much further. It has shown that the structure it has developed for classes is applicable to propositions as well, in toto. So all Copi's arguments can be dealt with by Boolean Algebra and if by Boolean Algebra, by Nyaya also.I have shown this by discussing the examples given by Copi. I have taken the examples of Copi verbatim to leave no doubt that I am tampering with them to prove something by hook or by crook.

The greatest deficiency of Nyaya Logic is that it does not seem to appreciate the difference between the content and form of argument. The Greeks saw it as early as Aristotle who has clearly discussed the figuress and moods of the syllogism. Failure to recognize the form of argument and propositions has led the Nyaya to say that *'sprinkle by fire '*is no statement it is a meaningless noise. This would mean that the Arabian nights and the Panchatantra stories are meaningless noises. They talk of the magic carpet, the ring by rubbing which a demon appears and is ready to perform any duty you ordain. With all this far from being meaningless noises they are high class literature. Take the sentence *"sprinkle by fire.'* The Nyaya does not regard this as a meaningful sentence. With the existence of

the fire jets sprinkling by fire is no longer a piece of imagination, we can actually sprinkle by fire. It is not that the statement is meaningful nowadays but was meaningless before the invention of fire jets. No sentence that is meaningless can ever become meaningful. The son of a barren woman and the square circle can never become meaningful because they are self contradictory and therefore they stand for nothing.

The aeroplane the telephones and now the computer was once only a creature of imagination. It is not so today because the sentences postulating them were not meaningless even before these inventions

It has been proved that perpetual motion is never possible under the known laws of Physics. But theae laws are not based on any complete axiom system. They are based on observations The axiom systems complete in themselves are found in pure mathematics not in Physics.

The development of pure mathematics has demonstrated the difference between meaningless sentences and sentences which are the play of imagination. We can develop a mathematics by formulating axioms which obey the following rules:

1. Axioms should not contradict another.
2. The axioms should be independent i.e, no axiom should follow from one or more other axioms, if it does so it is a theorem and not. an axiom.
3. The set of axioms should be complete so that the addition of any new axiom leads to contradiction.

It is not necessary that the axioms should describe the perceptible world. A mathematical system built on such axioms may not describe anything in the actual world. Since the axioms in every system are complete such that the addition

of any new axiom to it leads to comtradiction these systems are independent. Our actual world is one such system.

Leibniz says it is one of the possible and the best of all the possible worlds. Russell says that though it is one of the possible worlds it is certainly not the best of all the possible worlds. If I had omnipotence, I would have created a much better world.

I once heard apravachana (religious discourse) by Bhau Shastri Vaze in which he said that the *shabdaprmana* unlike the other pramanas can give us knowledge of unperceived or even imperceptible objects. In this he seemed to refer exactly to the fact that the Arabian nights etc., are not meaningless though they describe an imaginary world.

When I heard him I thought that he was expounding some work of Indian Logic. The possibility that such a work exists cannot be ruled out...

If language were not capable of transcending perception inventions would never have been possible

Delimiters

Indian Logic demands ***avachchedakas*** i.e delimiters for the terms used so that the statements become sufficiently exact to be used for reasoning. The mountain must be sufficiently specified to make its firefulness exact. The properties which are necessary for this specification are called delimiters or *avachchedaka*s i.e. distinguishing properties in the sentence. In *'Mountain is fireful"* mountain is called*paksha* that is the subject with regard to which something has to be proved and fireful is the *sadhya* i.e something which has to be proved concerning the *paksha*.

It is not necessary that the *paksha* must be a class, it can be a proposition since according to Boolian Algebra propositions

can be substituted for classes in any reasoning. Now what is the *paksha* and the *sadhya* in the following propositions?

1. *If I study I will pass.*

The *paksha* is the antecedent *if I study* and the *sadhya* is the consequent *I will pass* because the consequent says something about the antecedent.

2 *Either Rama will live today or Ravana will live today* Ram or Ravana is the *paksha*, will live today is the *sadhya*

3 *Men may come and men may go but I go on forever*

Men may come and men may go is the *paksha* and I go on for ever is the *sadhya*. In order to specify what exactly is the *paksha* and the *sadhya* we must state their delimiters.

Let us start with the*paksha*. If one sees a mountain and smoke coming from it the *paksha* in the statement Mountain is fireful is: this i.e. the mountain particularized by the pronoun this and the mountain from which the smoke is seen to be coming. So *'this"* is the *avachedaka* of the*pakshata.*

But suppose somebody is sitting in a plain and he sees smoke coming out from a height he says *"mountain is fireful",* the mountain is not delimited by the pronoun *this* because he does not see the smoke coming out of a particular mountain. Nevertheless, he is sure that the smoke is coming out of a mountain and not from somebody's kitchen because the habitation is far away from the spot. So here the delimiter of the *paksha* mountain is *mountainness* or*parvatatva* or the quality which distinguishes the mountain from non mountains or the quality which is sufficient for anything to be called a mountain.

Now let us turn to the *sadhya*i.e. fireful. The delimiters of this *sadhya* must also be specified. *"Mountain is fireful*" may mean: *the mountain is on fire*. To justify this a considerable portion of the mountain must be covered by the fire. But here

also it can be said that the statement *the mountain is on fire* is figurative because the mountain being rocky cannot catch fire So if the statement *the mountain is on fire* is figurative and figurative statements cannot be allowed in logic. The proposition which asserts the *mountain to be fireful* in this sense cannot be a proposition of Logic.

So, *the mountain is fireful* means *the mountain is fired-object-ful.* The word fire stands for an inflammable object on the mountain which has caught fire. So the delimiter of the *sadhya* is indirectness i.e, vyavahitatva.

Just as the paksha and the sadhya have to be delimited, their relation must also be specified. That means the *sadhya*ta fire is delimited by a particular relation. In the case of the mountain and the fire on it, the relation of the fire to the mountain differs in different cases. If a heap of grass on the mountain has caught fire the fire has the relation inherence with the grass and the grass has the relation contact with the mountain. The heap of grass is detachable from the mountain without any change in its qualities, but fire is not detachable from the grass.

In case some trees have caught fire, the fire is as before inherent in the trees and the trees are also inherent in the mountain. The trees cannot live when they are uprooted.

In case the proposition -. there is fire on the mountain replaces the proposition *the mountain is fireful*, the *paksha* is still the mountain but the *sadhya* becomes the fire and not firefulness, the *sadhya* is related to the mountain by the relation on.

Every statement and not only the conclusion of a reasoning must have delimiters.

Relations

Relations are vital in reasoning. Nyaya lays down various relations like *samyoga* and *samavaya.*

1. *Samyoga* or contact.

2. Samavaya or inherence.

1. *Samyoga* or contact.

This obtains between A and B only when A and B can exist without each other. So the relation between the living heart and the living body is not *samyoga*.

Samyoga is *avyapyavrtti* i.e. resting on what it does not cover completely, a part of time touches a part of space. Every part of space has its corresponding event but events in the past do not exist so their space time also does not exist now so does the space time of future events. So present is the only *samyoga* of space and time

But present is a relative notion since every moment is divisible into three moments which constitute the past, present and future within it.

When I touch the table with my finger the relation of the table to the finger is called *samyoga*. This relation has interesting properties. It is *avyapyavrti* If A is in contact with B the whole of A is never in contact with the whole of B. The whole of my finger can never be in contact with the whole of the table. Therefore, the statement that the finger is in contact with the table ipso facto implies that some portions of the finger are not in contact with the table. From the presence of *samyoga* we can infer the absence of *samyoga* between the same things.

It may be thought that the point of a needle is wholly in contact with what it touches. According to Nyaya even a point of the needle has oarte which do not touch the surface on which it rests. Space in infinitely divisible and however minute a part of the needle you take there will be minuter parts which do not touch the surface on which it rests. Does this mean that Kanada propounded the infinite divisibility of space? The Kanada sootras do not suggest that he did not.

It should be noted in this connection that Kanada does not talk of space at all. He talks of *aakasha* which is known by the property sound. So *aakasha* is certainly not space. The other word which can indicate space is *dik*, but *dik* means direction and empty space cannot be inferred from direction.

So Kanada's system allows only spatial dimentions and NOT empty space. If Kanada believed in infinite divisibility it is the infinite divisibility of spatial dimentions and not of empty space.

In any case, the definition of *samyoga* does not need infinite divisibility. We can safely say that any perceptible portion of a perceptible dimention is divisible. If this is *samyoga*: what is the relation of the finger to the palm?

The palm by definition includes the fingers, so the relation is that of whole and part. The whole is inherent in the part. This relation is *samavaya.* But, one can still ask whether the palm can be called a palm when the fingers are chopped off. The reply would be: it was once a palm. So the relation is not that of contact. We can think of contact only when the relation is not that of part and whole.

Again the question arises: when the finger is in contact with the table is there any space between the finger and the table? We have to admit that no part of the finger can be at a zero distance from the table because that would mean that part of the table and the finger are identical. So the distance approximates to zero but is never zero. This means contact is minute separation and not in separation.

Though the distance between two things in contact is not zero, zero is the limit to which it can be made to approach as closely as possible.

Similarly, in the case of *samavaya* it cannot be laid down with the loss of how many threads the cloth ceases to be a cloth, just

as one cannot lay down the loss of the number of hair which makes a man bald. The transition is not abrupt.

The relation between two *Vibhu* i.e. all pervasive entities is not regarded as *samyoga* by Nyaya. *Vibhu* entities are those which pervade both time and space. Thus, they are absent nowhere and at no time. But *samyoga* is *avyapyavrutti* i, e, its presence implies its absence. The whole of A can never be in contact with the whole of B.

It may be said that It is raining in Nagpur at 5 P.M. is a *samyoga* of time and space because a part of time is in contact with a part of space. What is all pervasive can have parts? But accordding to Nyaya, a moment of time will have to be partly in contact with a point in space, but moments and points have no parts.

This difficulty has been solved by modern notions of infinite divisibility. Though space and time are infinitely divisible the series of this infinite division has only a first term. It has no last term. The infinite series of the fractions 1/2,1/2. has no last term.

2. Samavaya or Inherence.

When A cannot exist without B but B can exist without A, A is said to inhere in B. Thus the cloth inheres in the threads. We cannot say that the threads inhere in the cloth because they can exist without the cloth.

Similarly, the machine inheres in its parts, the substance inheres in its qualities, motion inheres in what moves and the universal inheres in the particular.

If we say that the cloth does not inhere in the threads, the cloth is nothing but the threads; we cannot say that the cloth becomes red blue by the use of red and blue threads, but that the threads themselves become red blue. Red threads and blue threads make a red blue cloth but the threads do not become

red blue, they retain their individual color. Inaccurate statements of *samyoga* and *samavaya* can lead to fallacies.

Example-1

Natural teeth are inherent.
Artificial teeth are an external appendage.

So artificial teeth can never serve the function of natural teeth.

Here the word inherent can lead to this conclusion, if it is used in the sense of *samaveta*. If like the cloth in the threads natural teeth are inherent in the gums they are irreplaceable. But their relation to the gums is more similar to the relation of false teeth to the gums than that of the hand to the body. The relation is that of *samyoga*. The last point of the teeth is not identical with the point of the gums with which it is in contact. In the case of the hand it will not be possible to distinguish between the point of the hand and the point of the shoulder to which it is joined.

Example-2

Life is inherent in the body,
the body is not inherent in life.
So life cannot exist without the body but the body can exist without life.

No argument can be assessed without taking into consideration the delimiters. The body can exist without life is a correct statement if the corpse can be called a body and 'exists' is qualified as 'exists for a short period'. The corpse exists for a short period because it is lifeless. If the cause of the shortness of the existence of the corpse is lifelessness the statement that the body can exist without life cannot be said to be accurate.

Example-3

When the body dies something goes out of it.

That something is called the soul.

We can use the following analogy here. When the car stops something goes out of it. That something is motion. Just as the motion is inherent in the car but the car is not inherent in the motion what is called the soul can be inherent in the body and the body may not be inherent in the soul.

Paryapti or sufficiency

This is the relation of the members of a class to the class. No member of a class is the class but the members together form the class. It is only the members together that are sufficient to form the class not the members severally.

Such a class has the following logical property. Many inferences from the members to the class are fallacious. For example: Every boy in the class has a father therefore the class has a father. Examples can easily be multiplied. The following is from Aristotle:

Seeing that hand and foot and every one of our members has some obvious function, must we not believe that in like manner a human being has a function over and above these particular functions.

It is not true that when limbs have a function the one who has limbs has a function because the relation between the human being and his limbs is *paryapti.* When y is *paryapta* in x , x cannot have the predicates of y.

The relation of *paryapti* is the foundation of Boolean Algebra. It has served to show the self contradiction in the notion of an Omnipotent, Omniscient and Omni good God. Almighty is a self contradictory notion because the almighty cannot make a stone which He cannot lift. The notion of an omniscient God is self contradictory because such a God cannot experience the state of mind of an ignorant man. Such a God cannot be Omni good because he cannot have the good quality of improvability.

Russell calls this the ***vicious circle principle*** which is stated thus: Whatever involves all of a collection must not be one of the collection.

F.P. Ramsey objects to this saying: "We may refer to a man as the tallest in a group thus identifying him by means of a totality of which he is himself a member without there being any vicious circle".

It is not possible to agree with Ramsey. We do not identify the tallest man by means of a totality but by separating him from it. Thus the tallest man is not taller than all, he is taller than all but one. If he is tallest in the totality of which he himself is a member, he will have to be taller than himself thus resulting in the inevitable contradiction.

In this connection it should be noted that neither Gautama nor Kanadaa includes a creator God in the enumeration of accepted entities or padarthas. This may be the result of their acceptance of the relation *paryapti*.

Immanent conceptions of divinity do not suffer from the totality fallacy. Immanent conceptions of God regard Him as existing within the world. It is impossible to say anything about the God who transcends the world. Our languages function only within the world.

It should be noted that Kanada and Gowtama are no exceptions in not accepting a creator God. Charvak, Jain and Budhist darshans are known to be atheistic. Samkhya accepts only the *prakriti* and the *purusha* neither of which is God, Yoga the correlate darshan of Samkhya is in line with this. The goal of Yoga is *samadhi* and *samadhi* is not the vision of God but of the soul as independent of *prakriti*. The *Meemmsa* clearly says that the deities invoked in sacrifice are postulated and NOT real entities. The *vedantasootras* contain a sootra which clearly says that the concept of God is not reasonable. Even Ramanuja who is supposed to be a theist describes the world as the body

of God like Spinoza who regards extension i,e. space as a feature of God along with thought.

There is the *Shaiva Darshan*, the *Pashupat Darshan*, and the *Pouranika Darshana* which expound a theism nearer to the God of the theists.

Theism in India always tended to be polytheistic. The concept of the trinity of *Brahma*, *Vishnu* and *Maheshwara* answering to the creator, the maintainer and the destroyer of the world is well known. These three are *paryapta* in the world i.e. creation maintenance and destruction are processes within the world. Everything within the world is created and this principle of creation is *brahma* everything stays for some time and the principle of this is *Vishnu* and everything in the world is destroyed, the principle of this is *Mahesh*. But everything in the world is created does not mean the world is created, everything in the world lasts does not mean the world itself lasts and everything in the world is destroyed does not mean the world itself is destroyed. Brahma, Vishnu and Mahesh are immanent in the world and since the events they signify are different they cannot be identical, they have to be different. Polytheism is thus inherent in the immanent conception of divinity.

God did not figure in the principal darshanas. But, in the tenth century *Udayana* defended Gowtama against the Buddhists. He wrote an extensiye treatise called *Nyayakusunanjali* seeking to prove the existence of God by logic.lt is difficult to say whether he posed to interpret Gowtama or was propounding hisown views. Later in the 13th century *Gangesha* gave important place to the eeshvar anumana or the argument for the existence of God. This was not looked upon with favor by his principal commentator *Raghunath* who is supposed to hold that there is no god apart from direction and time.

The notion of a creator God was not new to India but atheism was not considered a sacrilege or a sin. In fact, theism was looked up on as an idea of the laity. After the triumph of Islam, the idea that atheism is a sin and calling anyone an atheist is tantamount to condemning him became predominant.

Prelslamic Indian theism was imminent and pluralistic unlike the Zorastrian Christian and Islamic theism which is transcendental and Monistic Pantheism is the most thoroughgoing form of immanent theism which regards God as pervading the world. Pantheism is very often described as polite atheism.

Take the theism of the *Geeta*. Therein *Krishna* says that He is what is best in anything. So the word God is used as a synonym for excellence.

Polytheism is natural to pantheism. Pre Islamic Indian theism is polytheiatic. The triumph of Islam rendered all forms of immanent theism, polytheism, pan theism etc as condemnable as atheism.

This gave rise to the Bhakti movement. The bhakti concept of God was more similar to that of Islam than to the concepts of God in the darshanas andpuranas. Pre Islamic Indian theism did not hesitate to worship both Krisna and Rama as Gods, But Tulseedas squarely warns Krishna that he will not bow before him unless he comes before him with the famous bows and arrows.

It is strange that only logic kept on developing in the period of Islamic dominance. No other branch of knowledge seems to have shown this vigour-during this period. It will not be easy to explain this.

The Properties of Relations

Relations have the following properties: *parampara* or transitiveness.

A relation is transitive when A has the relation to B and B has the relation to C and A has the same relation to C. Greater than is the obvious example of this relation. This relation is very useful in studying order.

Some relations are symmetrical i.e. if A has the relation to B B has the same relation to A. If A is the brother of B then B is the brother of A.

But wife is not of such a relation. If A is wife of B, B is not the wife of A. In such cases Nyaya uses the phrases *nishtha* aid *niroopita*i, e. residing in and with reference to. Wifehood is *seetanishha*: resides in Seeta and is *niroopita* i.e referred to Rama. *Samyoga*is a symmetrical relation When the finger is in contact with the table the table is also in contact with the fingre.

It is not a reflexive relation because nothing can be in contact with itself *Samyoga*.

It is not a transitive relson because if I touch a man who is sitting beside me I do not touch a man who is sitting beside him.

Inherence is not a symmetrical relation, because the cloth is inherent in the threads but the threads are not inherent in the cloth.

It is not transitive because the colour of the cloth is inherent in the cloth but not in the threads.

Paryapti is asymmetrical. The heap is *paryapta* in the grains but the grains are not paryapta in the heap.

Paryapti is not transitive because the heap is *paryapta* in the grains but the grains are not *paryapta* its particles. The are samaveta in them.

The numbers from 0 to 9 are 10, but 10 is not constituted of these numbers as the heap is constituted of the grains.

Relations are not only between two terms. The relation: between rests in three terms A, B, and C when B is between A and C.

The relation most important for reasoning is. the includer / included relation. Man and animal, iron and metal, novels and books have included includer relation, the former is included in the latter.

Fallacies can result by confusing one relation with another- For example, a monkey sitting on the branch of a tree is said to be sitting on the tree. Similarly, a man who cuts a branch of a tree should be said to cut the tree.

Here the relation of the monkey to the tree is *samyoga* and*Samyoga* is always of parts So it is correct to say that a monkey sitting on the branch of a tree is sitting on the tree.

Cutting on the other hand is an action not a relation. This action is not *avyapyavrtti*. ln order to cut the tree the axe will have to operate on the trunk not on the branch. The trunk and not the branchimvolves the whole tree in the action of cutting.

Samyoga by itself is not transitive. When the buffer of the first bogie of a train is in contact with tie buffer of the second and the buffer of the second in contact with the third there is no semyega of the first bogie with the third.

When all the bogies are joined and the first bogie is joined to the engine a transitive retatiom puller and pulled is created and the pull of the engine to the first bogie is effective on the last through the intermediate bogies. But this is not the transitiveness of the *samyogas* but of a new relation.

Samavaya is transitive. The wall is inherent (*samaveta*)in the bricks and the bricks are inherent in the clay. Thus the wall is also inherent in the clay because it cannot exist without the clay.

Abhava

This can be translated as 'absence'. In order to understand absence, we must define what is meant by" not". Not has to be defined as in Boolean Algebra as what makes the following proposition true: A or not A is equal the universe. Here the universe is either all classes or all propositions.

This definition is not found, in Nyaya. But Nyaya does take not as more fundamental than absence.

Absence is always absence of something, X that exists, exists at a time and at a location. The negation of this time and location implies that x may not be absent at other times and locations.

This is defined as different from inherence and &ever inhering. Here the negations different from inhering and never inhering are the primary negations used in the expression: Absence of a jar on the floor does not inhere in the floor as the cloth inhere in the threads The cloth cannot exist without the threads but the threads can exist without the cloth Here the absence of the jar exists at the same time everywhere where the jar not kept. In fact, absence never inheres in anything. The cloth which inheres in.

Expression

Absence of a jar on the floor does not inhere in the floor as the cloth inheres in the threads. The cloth cannot exist without the threads but the threads can exist without the cloth. Here the absence of the jar exists at the same time everywhere where the jar is not kept. In fact, absence never inheres in anything. The cloth which inheres in the threads has many properties not possessed by the threads. The absence of the jar on the floor does not possess any properties not possessed by the floor.

The word absence itself conveys no meaning. We have to specify what is absent. That is not so in the case of the cloth which inheres in the threads.

The relation of the absence of the jar to the floor is called svaroopa i.e. nature of the floor itself. This means there is no difference in the properties of the floor and the properties of the floor from where a jar is absent.

This shows that the negation indicated by the absence of the jar on the floor is quite different from the not A in A and union not A=l.i.e. A and Not A comprise the whole universe.

There may be a difference in the properties of the floor where ajar was kept or where it is broken as well as the floor where the jar is being made. The former is a locus of pradhvasabhava or post negation and the latter of pragabhava pre negation.

The third is *anyonyabhava* i.e. A is different from B, is *anyonyabhava* of A. This does not imply an absence of A. When we see a man coming from a distance we may mistake him for A, when we recognize B we say A is not B so we did not see A coming.

The following fallacies can occur by confusing the four namely: *pagabhava, pradvasabhva, anyonyabhava and atyantabhava.*

Fallacy-I

Narada to Kansa

The son of Devaki will be your doom.

Kansa.

Since Devaki has no son I have no doom.

Kansa is committing the fallacy of confusing pragabhava with atyantabhava.

Fallacy-II

It is absurd to blame Nehru for what is happening to day because Nehru is dead and gone. This is confusing pradhvansabhava with atyantabhava.

Fallacy-III

Woman is different from man. So it is wrong to talk of non-discrimination between the sexes.

This is confusing *anyonyabhava* for *atyantabhava*. Men and women are different o some respects but are also similar in some respects. Discrimination implies treating them as different even in those respects where they are similar Confusing absence with relation can lead to fallacies.

If everything related to God must exist, then the absence of God must also exist.

Relations within the propositions

Just as the *sadhya* and the *paksha* have its delimiters they can have variouswith each other. When a tree on the mountain has caught fire:

the tree is to the mountain:

- by soil/crop relation *kshetrankura sambadha* and

the fire is to the tree:

- by inherence i.e. *samavaya sambandha*.

The *ksheetrankura sambandha* is clearly the relation of the crop to the soil. The details of this relation will involve us in Botany. In Logic we must rest content by pointing our finger to Botany.

The relations are of two principal kinds. 1 *vrttiniyamaka* and 2. *Vrutti-aniyaamaka* i, e, determiners of locus and non determiners of locus. When two jars are in contact none of

them is the locus of the other. But when a jar is in contact with the floor the jar rests on the floor, it cannot rest without it.

For A to be the determiner of the locus of B A can rest without B but B cannot rest without A. But this is not enough. Man cannot live without food but the food can rest without man. Still the food is not the locus of man. For X to be the; locus of Y. one who finds X should automatically find y. One does not find man by finding food...

The five limbed Argument

The Nyaya uses only one form of argument. This is called the five limbed sentence. The five limbs are as under:

1. *pratijna*

This is what Euclid calls enunciation. This is a sentence which declares what is to be proved in the argument. In the usual example the enunciation is:

The mountain is fireful

The pratijna has a*paksha* and a *sadhya*. The *sadhya* is what is to be proved and the *paksha* is that with regard to which the *sadhya* has to be proved,

This is not so obvious in the following.

If Alice is elected class president, then Betty is elected vice president.

Here some thing is said about 1 Alice is elected class president what is said is 2 then Betty is elected Vice President. So 1 is *paksha* and 2 is the *sadhya.*

To err is human

The *paksha* is to err and *sadhya* is *human* because something is said about erring and what is said is that it is human.

Men may come and men may go but I go on for ever.

Here "I" stands for the brook. In order to find out what is the *paksha* and the *sadhya* here we must use this sentence as the conclusion of some argument. The following will do.

When men go away from the shore of the brook as also when they come to it, the brook is flowing.

Therefore, whether the brook flows or not does not depend on whether men come or go.

This is a statement about the flowing of the brook. So flowing of the brook is the *paksha* The flowing does not depend on the coming or going of men is the *sadhya*.

Here brook is the *paksha* indirectly, the direct *paksha* is flowing or not flowing No serious fallacy would occur if the brook is regarded as thepaklsha. But this will not always be the case. For example

A's house is dirty.

Here A's house is the *paksha*but if we regard A as an indirect *paksha* a serious mistake may be committed. A may not at all be responsible for the dirt. So where a conclusion is drawn on the basis of an indirect paksha it must be regarded as fallacious.

2 The hetu

This is the basis on which the *sadhya* is to be proved. In the usual example the hetu is: because the mountain has smoke.

Gangesha says that the hetu is: because of smoke and not because the mountain has smoke. The role of stating that the hetu belongs to ihe*paksha* is performed by the *Pratijna:* .

This is totally wrong because nothing can be a hetu if it does not belong to the *paksha*, and that the hetu belongs to the*paksha* is known by perception. It is part of the data. The *Pratijna:* on the other hand processes the data already made available by perception which is the third lingaparamarsha.

3 *Vyapti*

This is the general statement: wherever there is smoke there is fire. This is the most important part of the data.

NavyaNyaya has lent so much attention to the definition of *vyapti* that it requires an independent treatment. Here it should suffice to say the vyaptt is class inclusion If class A is included in class B A is called *vyapya* and B is called *vyapaka*. In the usual example the class of objects which emit smoke is included in the class of objects which are called fire.

4 *Pratijna (Upanaya):*

This is the statement which is derived by processing the data. It runs thus The mountain has smoke included in fire.

5 *Nigamana*

This is the conclusion which runs:

Therefore, the mountain is fireful.

It will be seen that Euclid's theorems are couched in these very five limbs. (*Pratijna* is the enunciation, the *hetu* and the *vyapti* are the data, then comes the processing of the data i,e the *Pratijna:* and finally the conclusion.

Euclid belongs to 300 B.C..Gowtama is much more ancient. Since Gowtama is mentioned in the Avesta his work may have been prevalent in Iran and Euclid may have grown in the circles where the five limbed argument was in vogue.

But Aristotle is older than Euclid.His Logic does not seem to have anything to do with the five limbed argument.

This may be so because Aristotle is mainly concerned with the syllogism. The syllogism does not contain any *Pratijna:* or processing of the data and the conclusion may have been supposed to make the enunciation redundant.

In fact, the famous syllogism about the mortality of Socrates is not valid without the following *Pratijna:*

Socrates regarded as a class described as the philosopher who drank hemlock is included in.the class of men which is included in the class of mortals.is mortal.

This follows since inclusion is a transitive relation.

Propositions can also be included in or excluded from each other If proposition PI is included in proposition P2 P2 can be inferred from PI. Quantifiers

Indian Logic uses delimiters. In their place Aristotalean Logic uses quantifiers. Where Indian Logic says that in the proposition man is mortal humanity is the delimiter Aristotalean Logic uses the quantifier All and says All men are mortal. Where Aristotle says some men are white, Indian Logic would say *white men are the included* and *men are the includers*.

The use of the word *some* in Aristotelian Logic can cause some confusion. Take the following example from Copi's Logic:

Some dogs have fuzzy ears.

My dog has fuzzy ears.

Therefore, my dog is some dog.

As it stands, the conclusion does not make any sense. This is avoided by using the language ofNyaya thus:

Fuzzy eared dogsare included among dogs.

My dog is fuzzy eared

Therefore, my dog is included among fuzzy eared dogs.

Here it may be thought that the conclusion follows from the second premise alone and the first premise is redundant. In Mathematical examples a solution reached by ignoring any

data is regarded as fallacious because there is a conclusion which can be derived by using the whole data and cannot be derived if any part of the data is ignored.

If you ask a shop keeper to give you a piece of cloth that is white and warm and he gives you a piece which is white but not warm or only warm but not white, you will not think that he has given you what you want.

Let us therefore see whether this conclusion is comparable with the shopkeeper's way of fulfilling orders. Without the first premise the conclusion may be true even if there are no fuzzy eared dogs apart from mine, with first premise we can say that there are other fuzzy eared dogs apart from mine

This makes the plural in the conclusion relevant. But for this it is necessary to interpret the word some as standing for more than one.

Let us now turn to the famous syllogism of Aristotelian Logic where the conclusion is Socrates is mortal. The *paksha* in this proposition is Socrates and the *sadhya* is mortal. What are their delimiters?

The delimiter of the *paksha* Socrates is; the philosopher who drank hemlock. The delimiter of the *sadhya* mortal is mortality.

The delimiting relation between the *sadhya* and the *paksha* is inherence because mortality cannot exist independently of living- beings.

This relation is not stated in the conclusion. What is stated is that Socrates is included in the class of mortals. But this is the relation of inclusion and not inherence. Mortality is intended to be the *sadhya* by inherence in the *paksha* Socrates So the *sadhya*tavachchedaha relation is inherence. NOT inclusion. But the inclusion is based in this case on inherence. In other

cases, it may be based on some other relation. The inference is always based on inclusion and exclusion.

It is not only the propositions that are used as enunciations i.e. those intended to be proved that have delimiters. The words used in any proposition have delimirs. Let us take the proposition "wherever there is smoke there is fire" which is used as a *vyapti* or a general proposition on the basis of which the enunciation is proved.

If taken literally, the smoke *vyapti* can land us in panic when the smoke of some other house on fire enters our house. Therefore, the "wherever" has an understood delimiter: wherever the smoke originates. The delimiter is therefore mool or the origin of the smoke. Wherever there is smoke means wherever there is an origin of smoke.

Let us now consider some other cases of delimiters Consider the following oftmade statement

India cannot progress because of over population.

What is the delimiter of overpopulation? Number of people living in the country? This will mean Shri Lanka can never be overpopulated. So obviously we must take density of the population i.e population per square mile. But this is not enough.

In terms of density Saudi Arabia can never be overpopulated. So we must also take into account the natural resources into account and see if they are adequate for the population. So the delimiter of overpopulation is natural resources of which area is only one.

Now let us take some of the enunciations in the exercises in Copi's text book of Symbolic Logic to see whether the ideas of Indian Logic are applicable to them. In these illustrations the enunciations appear as conclusions and unlike Euclid and Indian Logic are not stated in the very beginning.

1. Men who have no wives sometimes have friends.

Here obviously the delimiter of friend is woman.

2. Snakes are reptiles

Here the *paksha* is snakes and the *sadhya* is reptiles. The delimiter of the *paksha* is the *samanya* or class of snakes and the delimiter of the *sadhya* is the *samanya* reptiles. The relation between the *paksha* and the *sadhya* is that of *vissheshana.and visheshya.*

It is not only the *sadhya paksha* and the *hetu* that have to be interpreted by considering their delimiters. Before being used for inference every statement in it must be checked to see under what delimiters it has to be interpreted for the inference to be valid.

A teacher was discussing nutrition. After listing various chemical ingredients of digestible substances, he asked the students to name five things which contain fat. One student replied "three butter- fried toasts and two *chapatis* smeared with ghee."

This reply contains some mistakes:

1. The question is about unprocessed food whereas in the first answer it is processed food.

2 The delimiting relation of fat and the eatable was assumed to be *samavaya* in the question whereas in second answer it is *sanyoga.*

Secondly the delimiter of the number five was five different things singly and not five made up by three plus two. The same applies to the number three and two. Both these numbers are made up by counting the same thing thrice in one case and twice in the other. In the words *of Nyaya,* the intended relation of the number five *is paryapti* between different *samanyas* and not between different individuals of the same *samanya.*

We may take another example:

We cannot expect justice from a family court, because it will be more interested in its family than injustice.

Here the delimiters of family and court have been confused The delimiter of family is the matters to be considered by the court and not the judges constituting the court The reasoning in Indian Logic consists of composing an *Pratijna:* or a logical product of the data and then drawing the conclusion by simplification. Simplification is inferring A from AB because if there is AB there is A.

Take the stock example:

1. *There is fire on the mountain*

- *Because there is smoke on the mountain because wherever there is smoke there is fire.*

The logical product of these data is called the *Pratijna:* . The *Pratijna:* here is: The Mountain which has smoke included in fire has fire. By simplification this gives: the mountain has fire.

2. *If the weather is warm then we go swimming.*

Here there is an additional premise that there is a consensus about what is warm. Consensus is that the minority agrees to abide by the decision of the majority.

3. If scarcity of commodities develops then prices rise.

It is not likely that every increase in scarcity is followed by some increase in prices. So the statement should be interpreted to mean that there is correlation between rise in scarcity and rise in prices.

4. Only executives have secretaries.

This means non executives have no secretaries. This is a relational statement in the form in which the proposition

appears the only negation that occurs is in the word only which is a double negation no non executives.

The *paksha* is non executives. Its delimiter is the property common to all non executives. Have no secretaries is not a negation of secretaries, it is a negation of the relation signified by 'having. Which of the *abhavas* it is, is not specified in the statement. It can be *pragabhava* if the secretaries are going to be provided to non executives and *pradhvamsabhava* if the facility has been withdrawn.

It is not *anyonyabhava* because kinds of non secretaries are not spoken of here. Suppose executives have class one secretaries. The proposition *only executives have secretaries* will not be true if non executives have class II secretaries. So the delimiter is unqualified negation of secretaries.

The delimiting relation between the *paksha* and the *sadhya* is *svamitva* i,e, possession which is expressed by the possessive case. The relation is further delimited by superiority and inferiority of service ranks, because possession is of various kinds. The possessive case in "my son" "my wife" "my house" has different meanings. I can sell my house but not my wife or son. Some may think that this is useless hair splitting. But they should read court proceedings to see that ignoring these differences has serious consequences. It has often been questioned whether the courts should have the power to "restore conjugal rights"

The use of Symbols

The use of symbols will make the process of deduction clear though Nyaya has failed to use symbols.

Any horse that is gentle is well trained.

Copi treats this proposition as equivalent to the proposition as: *All horses that are gentle are well trained.* But *any* does not mean *all*. It clearly means that a horse randomly selected from

the group of well trained horses is gentle. So the word *any* in this sense, is the *paksha*. Nyaya translates *any* as *yah kashchit* literally this means *whoever*.

Let mountain be M, F be fire and S be smoke. Then the reasoning can be expressed as:

1. M is MF	*pratijna* because,
2. M is MS	*hetu*
3. S is SF	*vyapti*

The product of, 2 and 3 is

4. SSFMF	*Pratijna (Upanaya):*

From this by simplification we get

5. MF	*nigamana*

4 is the *Pratijna:* It will be seen that it is the logical product of the whole data, and the *nigamana* is only one of the factors of the *Pratijna:* . The logical product is what is common to all the factors of the product. The factors of the product are the data.

Let us now see how the examples given in text books of Logic can be expressed in the above five limbed sentence.

I. Example:

All Europeans are white
Some men are Europeans
Therefore, some men are white

The Five Limbed Sentence:

Pratijna:	Some men are white.
Hetu:	Because some men are Europeans.
Vyapti:	All European men are white men.
Upanaya:	European men including white men constitute some white men.

Nigamana: Some white men i, e. in English Some men are white.

paksha= some men, *sadhya*= white, *pakashata-avachchedaka* = some *sadhya*ta-*avachchedaka*=complexion.

The *hetutavacchcedaka sambandha*= Includer included

It should be noted that the simplification some white men has to be expressed in English as some men are white because the expression *"some white men'* by itself is not used in English. In Sanskrit however it is permissible. For example, Jagannatha mentions some engrossed in rules and bye rules" (yama-niyama-raktah katipaye). In fact, the premises define a class which yields the conclusion. It is not the business of Logic to assure that the class exists.

II. Example:

Laxman is the brother of Rama. Ram is the husband of Seeta. Therefore, Laxnan is the brother in law of Seeta.

The Five Limbed Inference

1. *Pratijna:* Laxman is the brother in law of Seeta
2. *Hetu:* Because Laxman is the brother of the husband of Seeta
3. *vyapti:* Husband's brother is a Brother in law
4. *Upanaya:* Laxman is Brother in Law of Seeta including brother of husband of Seeta and Brother in Law of Seeta.
5. *nigamana*: Therefore, Laxman was the Brother in Law of Seeta.

It should be noted that in Sanskrit the conclusion would be *Laxman brother in law of Seeta* which would be regarded equivalent to *brother in law of Seeta Laxmana*, because the order of words is irrelevant for conveying information in

Sanskrit. The conclusion as it stands would invite the following criticisms from Logic

1. Laxman was not the brother in law of Seeta, if the Ramayan is a fiction
2. If the Ramayana is not a fiction, Laxman was not the brother in law of Seeta before the marriage of Seeta and after his or Seeta's death.

Since the verb *was*, is redundant for Logic we need not bother about these difficulties.

Here *paksha* is Laxmana, the *pakshatvachchedaka* is individuality. *sadhya* is brother in law. the *sadhyat*v*achchedaka* of a term to a relation is relationship, the *sadhyata vachchedaka* is *anuyogita* of a term to the relation the *hetutavachchedaka* relation to the *paksha* is *anuyogita* of a term to the relation,

It will be seen that the *avachchedaka* of the *paksha*ta is the deimiter of the *paksha* the *sadhyatvachchedaka* relation is the relation to the *sadhya* to the *pasksha*. But the *hetutavachchedaka* has got to be in relation to both the *sadhya* and the *paksha*

The involved expressions will not appear if we use the following symbols L for Laxman B for brother and I for Brother in Law H for husband of Seeta.

We then get the five limbed sentence thus:

1 LIS	*pratijna*
2 because LBHS	*hetu*
3 BHSBIS	*vyapti*
4 LBHSLIS	*Pratijna:*
5 LIS	*nigamana*

It is clear that the *nigamana.* LIS is the simplification of the *Pratijna:* LBHSLIS

Let us now take examples of Mathematical arguments.

III. Example: Arithmetic

pratjna: *This shoe costs 100 rupees.*

Hetu: *Because it costs half of 200 rupees*

vyapti: *Half of 200 is 100.*

Upanaya: *Hundred including half of 200.*

Nigamana: *This shoe costs 100*

Here *paksha* is this shoe cost, *pakshatavachchedaka* is object to be valued, *sadhya* is100 rupees, *sadhyatavchedaka* is cost, *sadhyatvachchedaka* relation is amount of cost., hetu is half of 200, the *hetutavachedaka* is half of cost. The *hetutavachchedaka* relation to the *paksha* is that of cost to the article, to the *sadhya* is the relation of one number to another

IV. Example: Algebra

Pratijna: *y=5*

Hetu: *because 10y = 50*

vyapti : *Equals divided by equals are equal*

Upanaya: *5 including 50 by ten = (y = 5)*

nigamana: *y = 5*

Here *paksha* is y, the *pakshatvachchedaka* is value, the *sadhya* is equality with 5.the *sadhytavachchedaka* is value, the *sadhyatavachchedka* relation is equality. The *hetu* is 10 y = 5 the h*etutavachchedaka* is equality, the *hetutavachchedaka* relation to the *paksha* is being 10 times and to the *sadhya* is that of general to an instance.

V. Example: Geometry

pratijna: *If two straight lines cross each other the opposite angles are equal*

hetu: *Because a right angle minus an opposite angle 1 is equal to a right angle minus an opposite angle.*

vyapti: *If x-y is equal to x minus z then y is equal to z*

Taking O for opposite angles E for Equal and R for the statement under hetu the *Pratijna:* becomes EROE

nigamana: By simplification from 4 OE

Here *pakshatavachchedaka* is opposition of angles, *sadhyatavachchedaka* is equality, the *sadhyatavachchedaka* relation is equality, *hetutavachchedaka* is difference from an identical quantity, and the *hetutavachchhedaka* relation to the *paksha* is included inclusion, to the *sadhya* is the same.

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Let us now consider some arguments in Copi's text book in the light of the above procedure.

Example-I

Pratijna: *All radioactive substances either have a very short life or have medical value.*

hetu: *No uranium isotope which is radioactive has a very short life.*

vyapti: *Therefore if all uranium isotopes are radioactive then all uranium isotopes have medical value.*

"The *paksha* is if all uranium isotopes are radioactive. Its delimiter is conditionality. The delimiter of the *sadyha* is

medical value. The delimiter of *sadhya*ta is fulfillment of conditionality. The *hetu* is yielded by the first two premises, the product of which cancels short life in uranium isotopes. This makes the condition in the conclusion true and thus the *sadhya* is true. The relation between the *hetu* and the *paksha* is condition satisfier and the condition.

The five limbed sentence would be:

Pratijna: *If all uranium isotopes are radioactive then all uranium isotopes have medical value.*

hetu: *No uranium isotope which is radioactive has a very short life.*

vyapti: *The sadhya: all uranium isotopes have medical value includes the hetu which is: long life of the uranium isotopes.*

The *sadhya* to the *paksha*: if, by the relation of condition fulfiller to the condition. So by simplification, the *sadhya* belongs to the *paksha*.

The premises use the phrase 'isotope which is radioactive. 'lt is not clear whether radioactive and non radioactive uranium isotopes are found in nature or the isotopes have to be made radioactive. In the latter case the relation of absence of short life with the isotope will be that of *pradhvansabhava*. The conclusion then will be to acquire medical value and not have medical value.

Example-II

Pratijna: *If something is lost then if everyone values his possessions it will be missed.*

hetu: *If anyone values his possessions so does everyone.*

vyapti: *Therefore if something is lost then if someone values his possessions then something will be missed.*

Here: "something will be missed" is the *sadhya*. Its *sadhya*ta is based on two ifs. So it is delimited by conditioned-ness. The relation delimiting the *sadhyata* is being the object of the verb missed. The *paksha* is constituted of two ifs which are its delimiters. It should be noted that the conclusion is NOT it i.e. what is lost will be missed. The emphasis is not on what is missed but on the fact that it is missed. So the *pakshata* is delimited by being the subject of a loss and not by being some particular thing.

Some may think that this amounts to going by the suggested meaning and not by the literal meaning and Logic should be concerned with the literal meaning alone.

This criticism is not justifiably applicable to this case. Literal meaning is what conveys information. The suggested meaning does not convey information, it evokes reactions. In this case the meaning which is alleged to be suggestive does not evoke reactions, it conveys information.

The premise is something is lost not that a particular x is lost. If something is lost x will be missed is a wrong inference because we do not know whether x is lost or y is lost. Some is defined as not 0, perhaps all in Aristotelian Logic.

Boolean Algebra also defines it as not zero. No zero can include all. When a group is formed by a common denomination and some of its members are found to have a common property and these some can even be 99% there is nothing on the basis of which it can be insisted that they can never be 100%.

The hetu is: every one values his possessions. This hetu emerges from the logical product of the first two premises.

This belongs to the *paksha* if, by the relation of fulfiller of the condition which is the hetut*avachchedaka*.

The *sadhya* is something will be missed. The *paksha* is if. The *paksha*t*avachchedaka* is conditionality. The *sadhya* belongs to it by the fulfiller of condition relation.

Example-III

Pratijna:	*Only a fool would lie about one of Bill's fraternity brothers to him.*
hetu:	*A classmate of Bill lied about Al to him.*
vyapti:	*Therefore if none of Bill's classmates are fools, then Al is not a fraternity brother of Bill.*

If none of Bill's classmates are fools, then Al is not a fraternity brother of Bill is the conclusion.

The *paksha* is: if none of Bills fraternity brothers are fools, and the *sadhya* is then Al is not a fraternity brother of Bill.

The relation delimiting the *sadhya*ta is conditionedness.

The deliniter of the *paksha* is conditionness.

The argument gives us one more statement that has to be assumed true in addition to the premises. These three statements can all be true only if the statement Al is a fraternity brother of Bill is false. So the *hetu* is consistency of the three statements. The relation delimiting the *hetuta* is the; logical product of the three statements. This product makes the *sadhya* i.e the consequent of the conclusion true.

Example-IV

Pratijna: *It is a crime to sell an unregistered gun.*

hetu: *All the weapons that Red owns were purchased by him from either Lefy or Moe.*

vyapti: *So if one of Red"s weapons is an unregistered gun, then if red never bought anything from Moe, Lefty is a criminal.*

The *sadhya* here is Lefty is a criminal. by being a consequent of a hypothetical proposition its *sadhya*ta is delimited by conditionedness.

The *paksha* is: if Red never bought anything from Moe. Since this is the antecedent of a hypothetical proposition its *paksha*ta is delimited by conditioned-ness.

This *paksha* taken with the proposition that all Red's weapons were bought from Loe or Lefty leaves only Lefty as the seller. So the product of the antecedent with this proposition is the hetu. The relation delimiting the hetuta is being a factor of a product.

Example-V

Any man on the first team can outrun every man on the second team.

Therefore, no man on the second team can outrun any man in the first team.

Here the *paksha* is: member in the first team and the *sadhya* is "outrun everyone in the second team'. The relation between the *paksha* and the *sadhya* is indicated by *can* i,e the relation of shakti and shakya i.e capability and the object of capability.

The hetu is out running. The relation of hetu to the *paksha*: second team, is the converse of outrunning i.e not outrunning,

So the hetut*avachchedaka* is converseness of the relation outrun.

Example-VI

O Henry was William Sydney Porter.

O Henry was a writer.

Therefore, William Sydney Porter was a writer.

Here William Sydney Porter is the *paksha* The delimiter of the *Paksha* is the distinctive individuality as indicated by a proper name which has only one instance.

The *Sadhya* is writer whose delimiter is writerness. The *hetu* belongs to the *sadhya* by the relation of class membership and not class inclusion. The Henry family may belong to the class of families which have a long history but O Henry is not included in the class of families which have a long history because O Henry is not a family but an individual.

Example-VII

Anyone is unfortunate who bears the same name as a person who commits a crime.

Therefore, anyone who commits a burglary is unfortunate.

Here the *paksha* is anyone who commits a burglary. The *paksha*t*avachchedaka* is criminality not burglary, because it is assumed that burglary is a crime. The *sadhya* is "unfortunate" The delimiter of the *sadhya* is unfortunateness. The relation of the *sadhya* to the paksha is that of quality and qualificand.

The hetu is: bearing the same name as a criminal. The *hetutavachchedaka* is "burglary is a crime"

Example-VIII

Vacant lots provide no income to their owners. Any owner of real estate must pay taxes on it

Therefore, any owner of a vacant lot must pay taxes on something which provides no income to the owner.

The *paksha* is any owner of a vacant lot. The *paksha*tavachchedak is a randomly selected owner. The *sadhya* is obligation to pay taxes on non productive assets. The *sadhyatavachchedaka* is non productiveness. The hetu is : vacant lot is a real estate.

Example-IX

The professor of Greek at Si wash is very learned.

Therefore, all the professors of Greek at Si wash are very learned.

Here the conclusion is all the professors of Greek at Sivash are very learned. The *paksha* is all the professors at Sivash. The *pakshatavachchedaka* is all. Now the question is whether one can be called all even if the class concerned has only one member Professors is a plural. One professor cannot be called all professors.

This fallacy does not occur if the argument is expressed in Boolean Algebra. If P stands for professor, S for Sivash and L for learned the conclusion in Boolean Algebra would be PS is equal to PSL

The *sadhya* is learned, the *sadhyatavachchedaka* is learning. The relation of the *sadhya* to the *paksha* is that of qualification

to the qualified. The hetu is learning. The hetut*avachchedaka* is learning possessed by all.

Example-X

The fastest running person is a Scandinavian.

Therefore, anyone who is not a Scandinavian can be outrun by someone or other.

The *paksha* is anyone who is not a Scandinavian. The *paksha*t*avachchedaka* is random selection. The *sadhya* is the object of being outrun. The *sadhytavachchedaka* is runners faster than the non Scandinavian. The hetu is Scandinavian. The *hetutacachchedka* is fastest runner.

Example-XI

Any fish can swim faster than any smaller one.

Therefore, if there is a largest fish then there is a fastest fish.

Here the *paksha* is: if there is a largest fish. The *paksha*t*vachchedaka* is being a condition. The *sadhya* is fastest fish .The *sadhyatavachchedaka* is being a superlative. The hetu is existence of a comparative. The *hetutavachchedaka* is comparatively superior.

Example-XII

Every dyadic relation, which is transitive and non-reflexive is asymmetric.

These terms must be defined before we discuss this argument. Dyadic relation is that which holds between two terms. For example, A is the brother of B. Truth is the opposite of

falsehood. A transitive relation requires at least three terms. For example, A is greater than B and B is greater than C implies A is greater than C. A reflexive relation is the relation which A has to itself.

For example, A is identical with A A symmetric relation holds if A has the relation with B B has the same relation with A, For example, A is the opposite of B.

The relation greater than is dyadic, transitive and non-reflexive because A requires a B than which he is greater, it is transitive because if A is greater than B and B is greater than C Then A is greater than C and it is non-reflexive because A cannot be greater than itself.

With this given the relation of A to B cannot be the same as the relation of B to A. Since A is greater than B, B cannot be greater than A unless A and B are identical. This is prevented by the condition that the relation is non-reflexive.

Here the *sadhya* is asymmetrical. The *sadhyatavachchedaka* is asymmetricality. The *paksha* is dyadic, transitive and asymmetrical relations; the *pakshatavachchedaka* is the three properties of relations taken together. The relation between the *paksha* and the *sadhya* is qualification and the qualified. The hetu is stated in the term non-reflexive. The *hetutavachchedaka* is non-reflexivity.

Example-XIII

If you plant Tulips then your garden will bloom early, and if you plant asters then your garden will bloom late.

So if you plant booth Tulips and Asters your garden will bloom both early and late.

A portion of the garden blooming does not justify us in saying that the garden is blooming. The *pakshatavachchedaka* here is the major portion of the garden. With this *pakshatvachchedaka* the conclusion does not follow.

If however the plants are planted alternately so that both the plants are spread all over the garden there is a sense is supposing that the whole garden is blooming even if one type of flower is not blooming. The plants will have to have space in between them even if only one type of flower is planted.

But since this information is not given in the premises the conclusion is going beyond the data, is *atirikta* (extra) in the language of Nyaya and is fallacious.

Example-XIV

If all drugs are contaminated, then all negligent technicians are scoundrels. If there are any drugs which are contaminated, then all drugs are contaminated and unsafe.

All germicides are drugs. Only the negligent are absent-minded.

Therefore, if any technician is absentminded then if some germicides are contaminated then he is a scoundrel.

The data in the above reasoning describes a class of absent minded negligent technicians. The existence of such a class is proved by the existence of contaminated drugs. The *sadhya* is scoundrelness of this class The hetu is the existence of contaminated drugs. The *hetutavachchedaka* relation is the relation of contaminated drugs to negligence. Negligence is one of the causes of contamination. So the relation is that of result to cause.

The *paksha* is if all drugs are contaminated. Its *pakshatavachchedaka* is conditionality. The *sadhyatavachchedaka*. relation is that of the fulfiller of the condition indicated by the *pakshatavachchedaka*.

The *Pratijna:* Scoundrality includes the existence of contaminated drugs which is associated with the *paksha* as the condition necessary for the *sadhya* scoundrality which is therefore possessed by the *paksha*.

By simplification therefore the *sadhya* scoundrality has the required relation with the *paksha*.

Example-XV

If either Algebra is required or geometry is required, then all students will study Mathematics.Algebra is required and Trignometry is required.

Therefore, all students will study Mathematics.

The five limbed sentence will be

pratijna:	*All students will study Mathematics*
Hetu:	*Because Algebra and Trignometry is required*
vyapti:	*If Algebra and Trignometry is required all students will study Mathematics*
Upanaya:	*Study of Mathematics which includes study of Algebra and Geometry for all students who will study Mathematics.*
nigamana:	*All students will study Mathematics*

Example-XVI

If the weather is warm and the sky is clear, then either we go swimming or we

go boating. It is not the case that that if we do not go swimming then the sky is not clear.

Therefore, either the weather is warm or we go boating.

The five limbed Sentence has an understood *paksha* "the alternatives".

pratijna: *The alternatives are either the weather is warm or we go boating.*

Hetu: *Not swimming does not imply unclear sky.*

vyapti: *Not swimming and unclear sky imply non warm weather and no boating*

Upanaya: *Warm weather or boating includes not swimming and clear sky or unclear sky*

nigamana: *Therefore, the alternatives are warm weather or boating.*

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Fallacies

Now let us study some fallacies.

Fallacy-I

All the British speak English.

All educated Indians speak English

Therefore, all educated Indians are British

The five limbed sentence would be:
pratijna: All educated Indians are British

Hetu: because all educated Indians speak English

vyapti: All those who speak English are British

In order to draw this conclusion, we need the *vyapti*

All those who speak English are British

This *vyapti* is not available in the given argument for if B is British, speaking English is E, Educated Indians is I

We get

B=BE

I = IE

The logical product of the left hand side is equal to the logical product of the right hand side. This gives:

The British Indians speak English

The *Pratijna:* therefore is

The Indians included in the British speak English

This by simplification gives

The British Indians speak English but the premises do not mention any British Indians

It should be noted that' The British speak English" is a relational proposition, the relation between the British and English is that of the subject and the object of the action of speaking. The British are English speaking is a class inclusion proposition indicating that the British are included in the class of English speaking people. That the two propositions are not equivalent becomes clear if we substitute educated Indians for British. The educated Indians speak English but they are not included in the class of the English speaking

It is necessary to give examples which are clearer.

1A reads horoscopes 2 New inventions come from the West 3 The Polar Star rises in the North.

If we interpret the first statement to mean that A is an astrologer it may not be correct. The second statement also

does not imply that the West can be defined as an area from which new inventions come. The third statement alone obviously means that the polar star belongs to the class of heavenly bodies which rise in the North.

Just as a relation does not always define a class the same relation obtaining in different terms may define a different class. Take the following examples

1 Al kills Bl where both Al and Bl are soldiers of a sovereign government at war

2 A2 kills B2 where A2 is a robber and B2 the robbed

3 A3 kills B3 where B3 attacked A3

In the first Al belongs to a class of those who are doing their duty approved by society In 2 A2 is committing a crime In 3 A3 is acting in self defense

Now suppose we define these classes as Kl K2 and K3 in the following argument

K1 is K

K2 is K

K3 is K

Therefore, K1K2K3 is KKK i.e K in other words all three are killings,

This conclusion is not correct. Here Nyaya comes to our rescue. The logical product of K1K2K3 is not K but zero since these are anyonyabhavas. The logical product of jar and cloth is not jar cloth but null since there is nothing that is both a jar and a cloth.

Fallacy-II

He either wins or he resigns

He wins

Therefore, he does not resign

Pratijna He does not resign

Hetu Because he wins

vyapti

whoever wins does not resign

paksha is he, *paksha**tavachchedaka* is anyone because this is not a statement about any particular person. The *sadhya* is does not resign The *sadhya**tavachchedaka* is absence of resigning, the verb 'does', the present tense and the singular number are not parts of the *sadhya**tavachchedaka* Otherwise we can sayl the people who did not resign yesterday and 2 who are not going to resign tomorrow are not covered by the *sadhya*tavachedaka The sahyaht*avachchedaka* relation is that of act to the actor. The hetut*avachchedaka* relation to the *paksha* is that of action to the actor and to the *sadhya*i is that of effect to the cause

This *vyapti* is not yielded by the premises given, as shown below:

Let W be wins R be resigning, then we have

not W and R or not R and W

This is hot

W and not R

Fallacy-III

If Alice is elected class president, then either Betty is elected vice president or Carol is elected treasurer.

Betty is elected vice president.

Therefore, if Alice is elected class president then Carol is not elected treasurer.

The five limbed sentence would be.

pratijna:

pratijna:	*If Alice is elected class president then Carrol is not elected treasurer.*
Hetu:	*Belly is elected vice president*
vyapti:	*If Belly is elected vice president then if Alice is elected class president then Carrol is not elected treasurer.*

This *vyapti* is not available because it requires that if proposition 1 implies proposition 2 or 3 and 2 is given then 1 implies 3 which is false Using letters x, y and z in the same order we have

x = x(y or z)

y

therefore, x = x z

If y is given, then x is equal to xy not xz

Here the objection may be that I am applying Boolean Algebra to Nyaya and not vice versa as claimed by the title of the paper. This is only partly right. Nyaya does not use the symbolic technique to prove that the required *vyapti* is not available. But Boolean Algebra is using the symbolic technique to express what Nyaya has expressed without it Nyaya is not a substitute for Boolean Algebra but so is Boolean Algebra not possible by ignoring the ideas of Nyaya

Propostion 1 is the *paksha* and proposition 3 is the *sadhya.* The *pakshatavachchedaka* conditonerness. The *sadhyatavachchedaka* is conditionedness, the *sadhyatavachchedaka* relation is that of condition to the conditioned. The *hetutavachchedaka* relation is that of 1. for the *paksha* is that of one of a pair and the *sadhya* that of consequent to the antecedent and it has no relation with the *sadhya* which can be called *hetutavachchedaka.*

Fallacy-IV

1. If the seed catalogue is correct then

2. if the seeds are planted in April then

3. the flowers bloom in July

4. The flowers do not bloom in July

5. Therefore if the seeds are planted in April then 1 the seed catalogue is not correct

Numbered sentences

1 implies 2 implies 3

Not 3

therefore 2 implies not 1

The five limbed sentence is

pratijna:	If the seeds are planted in April then the seed catalogue is not correct
Hetu:	*because seeds do not bloom in July*
vyapti:	*If seeds do not bloom in July the seed catalogue is not correct*

This *vyapti* is not available because the seed catalogue does not say what will happen to the flowers when the seeds are not planted in April

The *paksha* is: if the seeds are planted in April. The *pakshavachchedaka* is conditionerness the *sadhya* is the seed catalogue is not correct, the *sadhya*t*vachchedaka* is conditionednes. The *sadhyatavachchedaka* relation is that of condition to the conditioned The *hetutavachchedaka* is being a consequent, the *hetutavachchedaka* relation with the *sadhya* is that of consequent to antecedent, and with the *paksha* is nil because it does not belong to the *paksha.*

Fallacy-V

If Ed wins first prize, then either Fred wins second prize or George is disappointed.

Freddy does not win second prize.

Therefore, if George is disappointed then Ed does not win first prize

The five limbed sentence:

pratijna:	*If George is disappointed Ed does not win first prize.*
Hetu:	*Because George is disappointed.*
vyapti	*If George is disappointed Ed does not win first prize*

This *vyapti* is not available because none of the premises singly or combined yield it. If P implies Q or R, R does not imply the denial of P

The *paksha* is if George is disappointed, the saadhya is Ed does not win first prize. The *pakshatavacchchedaka* is conditionerness. the *sadhyatavachchedaka* is conditionedness The *sadhyatvachedaka* relation is that of the conditioned to the conditioner. The *hetutavachedaka* is causality the *hetutavachchedaka* relation is that of cause to effect to the *sadhya* and that of fulfiller of condition to the condition to the *paksha.*

Fallacy-VI

Dogs are frequently encountered in the streets

Afgan hounds are dogs

Therefore, Afgan hounds are frequently encountered in streets

The Five Limbed Sentence:

pratijna:	*Afgan hounds are frequently encountered in the streets.*

hetu:	*Because, Afgan hounds are dogs*
vyapti:	*If x is a dog x is frequently encountered in the street.*

This *vyapti* is not available in the premises_ The hetu is dogs The hetutavacncnedaka is dognesss. But the hetutavacnsdaka required by the pratijna is the Afgan variety of dogs_

Fallacy-VII

American Indians are disappearing.

That man is an American Indian.

Therefore, that man is disappearing.

The five limbed sentence:

pratijna:	*That man is disappearing.*
hetu:	*because that man is an American Indian.*
vyapti:	*If x is an American Indian x is disappearing.*

This *vyapti* is not available because the *hetutavacchedaka* required is expressed by that whereas the *hetutavacchedaka* available is what is expressed by the plural American mdians_

Fallacy-VIII

The Bible tells us to return good for evil.

But Jones has never done me any evil.

Hence it will be all right to play him a dirty trick or two.

The Five Limbed Sentence:

pratijna:	*It will be all right to play Jones a trick or two*
hetu:	*Because he has never done me any evil*
Vyapti:	*If x has done me no evil it is all right to play x a trick or two*

It will be seen that the *vyapti* is not available because the passage does not tell us what return should be given for good.

It may be said that good and evil are the only alternatives. So if good is to be returned with good in all cases there is no point in saying that evil should be returned with good because in that case there is no such alternative as returning evil.

The point is that it is thought that evil should be returned with evil and it is necessary to contradict this.

The hetu has to have a *vyapti* with the *sadhya.* But this is not enough, it must have what is called *pakshadharmata* i.e it must belong to the *paksha.*

Note the following arguments:

1 Chengeez Khan must have venerated the mosques because he was a Muslim.

2 The Bhandarkar Institute must observe labour laws because it is an industry.

The hetu in the above two arguments does not belong to the *paksha* because Chengeez Khan was not a Muslim and the Bhandarkar institute is not an industry.

Informal Fallacies

Logic has brought under the title of fallacies some exchanges of words which the Nyaya does not recognize as arguments.

Copi gives the following examples:

Example-I

The classic trap for any revolutionary is always, what is your alternative? But even if you could provide the interrogator with a blue print, this does not mean he would use it.: In most cases he is not sincere in wanting to know

Copi says on this that here "instead of answering the question or showing that the question is inappropriate the writer accuses the questioner of insincerity. This is Argumetum ad Hominem

The above wording in order to pass as an argument has to be paraphrased as:

pratijna:	*Revolution is to be preferred.*
hetu:	*because it has no alternative.*
vyapti:	*Whatever has no alternative is to be preferred.*

In stead of showing where this reasoning is wrong the critic is saying that even if an alternative is shown the arguer would continue to say that there is no alternative.

The above including the argument is not an argument. The author of the above piece is conveying an information, true or false, about the arguer. The clause which, conveys this information is not one of the five limbs sanctioned by Nyaya and therefore the above piece is not an argument according to Nyaya.

Example-II

Argumentum ad hominem:

What you say is not true because you are the son of a paramour.

Here the hetu *you are the son of a paramour* does not have the properties of a hetu such as having a *vyapti* etc. Therefore, this can be called a fallacy and since the hetu is an abuse the fallacy can be named argumentum ad hominem.

Example-III

Argumentum adpopulum

"The inquisition must have been justified and beneficial, if the whole people invoked and defended it, if men of the loftiest

souls founded and created it severally and impartially, and its very adversaries applied it on their own account, pyre answering pyre."

Copi calls this fallacy argumentum adpopulum. He is assuming that it is addressed to devout inquisitionists.

The Nyaya calls such arguments *gaddarika Nyaya* or the whole line of sheep jumping down a precipice because the foremost sheep does so.

Argumentus adpopulum is not a formal fallacy, or a fallacy in an argument expressed in symbols for which meaningful words can be substituted.

Example-IV

Irrelevant conclusion

The Psychiatrists said in their opinion Bartee does not remember the attacks after indulging in alcohol, and therefore is not responsible for his crimes.

But I have heard such arguments being advanced in courts. In the Nyaya way of thinking this argument assumes the *vyapti*. One who is not aware of his deeds is not responsible for them.

This *vyapti* makes no distinction between unawareness caused by the accused himself and unawareness to which he was a prey. This distinction is vital

Example-V

Ad baculum

The Nazis used to send the following notice to German readers who let their subscriptions lapse.

Our paper certainly deserves the support of every German. We shall continue to forward copies of it to you. and we hope that you will not want to expose yourself to unfortunate consequences in the case of cancellation.

But as it stands it is not an argument in the eyes of Nyaya in order to advance this as an argument it should be put in the following form:

pratijna:	*Our paper deserves the support of every German*
heu:	*Because any German who stops taking it faces unfortunate consequences*

Here the *vyapti* as it stands does not make it argumenumt ad baculum. It is the suggestion that the unfortunate consequences will be engineered by those who run the paper.

"If you do not believe in God you will go to hell" is not an argumentum ad baculum if the arguer believes this.lt becomes so when he says this without believing it when all his other arguments fail.

Example-VI

Argumentum ad hominem

Congress should not bother to consult the joint chiefs of staff about military appropriations. As members of the armed forces they will naturally want as much money for military purposes as they think they can get.

Copi calls this argumentum ad hominem. Nyaya in such cases wants the delimiters to be made clear. If joint chiefs of staff are not to be consulted when the heads of civilian services are, this can be properly called argumentim ad hominem The relevant avachedaka for being a fallacy therefore is: The Chiefs of Staff being non civilian officers should not be consulted ...

The Nyaya is relevant here because it accepts shabdapramana i.e testimony as a pramana. This has been wrongly identified with acceptance of the authority of the Vedas which is called shrutiprmanya. The Nyaya nowhere appeals to the Vedas in expounding its principles and the word shabdapramanya does

not mean shrutipramanya. It means testimony of a witness as in a law court. lt is obvious that let alone justice, day to day life would be impossible without testimony.

In order to evaluate the above argument, the Logic of Testimony as accepted by the Nyaya is useful. The courts have to evaluate testimony every day. Though almost nothing is definitely known about the date of Gautama we can assume that some sort of courts existed in his day. There surely was some sort of government in his days A section of society devoting themselves to the development of Logic is not possible in a society where there is no government. Let us therefore use the methods used by courts to evaluate testimony.

The above argument claims that the whole people invoked and defended it. How does the arguer know this? History only indicates that those in power invoked and defended it. Since those who invoked inquisition did not derive their power by a free vote based on adult franchise the assertion that the whole people defended it has no basis. That inquisition was founded and created by the loftiest souls begs the question. One can argue that if they founded inquisition by no stretch of imagination can they be called lofty. Their impartiality is found even in Sir Hugh Rose who massacred the inhabitants of Zashi impartially. That the adversaries of those who started inquisition practised it themselves when they came to power far from showing that they approved inquisition shows that they were avenging the deeds of the inquisitors.

The Problem of Induction

How do we know that wherever there is smoke there is fire? There are two views on this.

Aristotelian Logic assumes that the statement all men are mortal is known by observation.

Charvak objects to this by saying that this begs the question. If the statement all men are mortal is made by observing all menthen Socrates is already observed to be mortal and the inference is apititioprincipi. If all men are not observed, then the premise all men are mortal does not deserve to be a premise. So Charvak says that inference is not a pramana, only observation is a pramana.

But very soon Charvak saw that this is an overstatement. So he added that not all inference is apramana because we accept *lokasprasidha* inference as aprmana. The word *lokaprasidha* has a technical meaning. Ihaloka means the world of perception as against paraloka which is not the world of perception. Inference used in science is verifiable by perception. Such inference is apramana. But the inference about God and life after death is not verifiable by perception. So it is apramana.

It should be noted that not verifiable is different from not verified. Ihaloka is that reality where we can lay down a method for verifying anything that constitutes it though none may so far have used that method.

The Nyaya view is that observation is not confined to particulars, it is also capable of yielding general statements. When we observe the occurrences of smoke and fire we do not observe only particulars we also observe universals and their bonds. This is called *samanyalakshanapratyasatti*. In the kitchen we do not observe merely the relation of the smoke and fire at a particular time and place. If this were so we could not have recognized that the phenomenon of smoke coming out of fire as an example of the same.

Phenomenon which was observed before, we would merely have observed them as separate and independent phenomena. What we observe is the pratyasatti or the intersection between the samanyalakshana i.e the disjunctive features of smoke as

smoke and the fire as fire, not of the smoke and fire at a particular occasion.

All perception is apperception. A child has eyes. In fact, his eyes are in a better condition than the eyes of adults. But still he will not hesitate to roll out of the bed and fall because mere eyes cannot see depth. Distant objects are less distinct than the near ones, they are smaller than the near ones as far as the image that falls on the retina is concerned. These distinctions in course of time are associated with distance.

The image of an object on the retina is upside down, but we do not see the thing upside down. By experience we associate the retinal stimulus of upside down with the upside up and the downside down. Thus what the radical empiricist calls perception is itself a composite of the stimulus provided by the senses and their interpretation by the brain.

The Nyaya uses the concept of mind in place of the brain. Nyaya's mind is the atom called the spam of attention. The upanishat says that the vision sees the visible by the mind NOT by the eye.

The fire and the smoke have a *samanyalakshana* or an intersection that is a portion which is both fire and smoke. This is called burning. Burning is the process of removing the non carbon elements in the thing to be burnt and smoke is nothing but small particles of carbon which float in the air because they are light. Carbonization is the intersection which enables us to infer fire from smoke.

After more extensive and accurate observations we come to know that the process of burning does not necessarily require fire. Fire has both light and heat but what is required for burning is only heat. We get only light not heat from tube light but by touching hot water we get only heat without light. Physics has separate chapters on heat and light.

Like fire we also begin to distinguish smoke from gas. We get steam by heating water but we do not call it smoke because it does not contain carbon.

So the statement wherever there is smoke there is fire has to be amended as wherever there is smoke there is heat. If ghee is heated by lightless heat it will emit smoke i, e gaseous carbon. If water is so heated it will not emit gaseous carbon, it will emit steam which is only water in gaseous form.

But this does not mean that the smoke fire inference is logically wrong, it is logically correct within the delimiters recognized by Nyaya The delimiter of fire in that argument is lightful heat and of smoke is carbon particles.

But the *vyapti* wherever there is smoke there is fire has to be amended to wherever there is smoke there is heat. So Charvaka is right in saying:

As long as we have not seen all cases of smoke and fire we cannot rule out that there may be a smoke without fire.

This is because. we further come to know that steam is a gaseous form of water but smoke is not a gaseous form of wood. So further observation restricts the delimiters of the word fire and extends the delimiters of the word water.

Cognition depends not on pure perception but on perception inseparable from the processing by the brain. That is why the Nyaya describes the mind as the sixth sense organ.

So in ruling out anumana as a pramana, Charvak is forgetting that there is no pratyaskha which is not processed by the brain. This processing cannot be described as senese percepton because the brain is not a sense organ.

Now what is the bond between the smoke and fire? The bond is carbon. Burning makes the wood carbonless and the carbon woodless. Since carbon occurs in both the members of the pair it is a bond between the members of the pair.

Now let us take the *vyapti* All men are mortal. Just as in the smoke fire *vyapti* we found the process of burning, in the man mortal *vyapti* we have the process of dying, Just as burning makes wood carbonless and carbon woodless dying makes the body breathless and the breath bodyless. The breath is absorbed by the atmosphere and the body is decomposed.

So this is the pratyastti of humanity and mortality.

Let us take an example from Geometry.

vyapti: *The sum of the angles of a triangle is 180 degrees*

Here we have two classes the class of the number 180 degrees and the class of angles of a triangle. The pratyasatti or the bond between them is the number ISO. This is the class of the angles of a triangle, So the bond or the pratyasatt between the *sadhya* and the hetu is the relation class and its instance.

Let us now see what are the pratyasattis in the *vyapti*s of the arguments discussed before.

I

All European men are white men What is the pratyasatti between European and white?

This is a tricky question. If European refers only to the habitat there is no known relation between it and the white complexion. So European has to be taken in the sense of a group having a common heredity.

II

In inferring Brother in Law from brother of the husband, the pratyasatti between the sadhya and the hetu is that of definition.

III

The vyapti is: equals divided by equals are equal. Here the pratysatti is that of the axioms of Arithmetic.

IV

The uranium isotopes which have long life have medical value

The pratyasatti in this *vyapti* is that medical value indicates power to restore organization. This requires much more time than disturbing an organization. Therefore, a drug which itself ceases soon is less likely to have medical value than a drug which has a longer life.

It is agreed that this *pratyassatti* is speculative. But it is much more difficult to point out *pratyasattis* in life sciences than in Physical sciences.

V

The conclusion is: *If none of Bill's classmats are fools Al is not a fraternity brother of Bill.*

In order to derive this conclusion, the following conditions are necessary:

1. *Only a fool could lie about one of Bill's fraternity brothers to him.*

2. *A classmate of Bill lied about A! to him.*

But the conclusion itself is hypothetical, so the argument in essence is: 1 and 2 implies 3 implies 4

1 and 2 is *paksha* and 3 implies 4 is *sadhya*. So one implication is proved by another The pratyasatti here is logical implication which is defined by truth tables

We have two kinds of pratyasattis logical and empirical. Logical pratyasattis are derived form the axioms assumed. But empirical pratyasattis are not so derived.

Logic functions through language and language in as much as it is concerned with the empirical world uses words in senses which are commonly understood.

But common understanding is very gross and has to be continuously corrected. Let us take the word strong. We say stone is stronger than glass. Here we assume brittleness to be a proof of weakness. But then glass can cut stone, stone cannot cut glass, it can only break it. Thus glass is harder than stone and what is harder has to be regarded as stronger.

Let us now take copper and rubber:

We may say copper is stronger than rubber because it cannot be pressed. But copper will break if you bend it too often, rubber will not and what breaks sooner cannot be called stronger. On the other hand, rubber can be more easily cut than copper, so copper is stronger. But when you bend a plate of copper it remains bent whereas rubber when bent quickly regains its position. So elasticity is an indication of strength and rubber is stronger than copper

Now take iron and copper. Iron is regarded as stronger than copper. But if you hammer both copper and iron, iron will break but copper will just become flatter without breaking. So copper is stronger.

Now take a jar of clay and a jar of brass. The clay jar will break when dropped, the brass jar will not. So brass is stronger than clay. But brass will melt when heated too muchjit can rust in time and if curd is placed too long in it it will get coroded itself. The clay jar is proof against both these.

This shows that the word strong widely used in common parlance is too vague for logical thining. But it serves the purpose of ordinary discoufse where context fixes its meaning

Science has made tremendous strides by fixing the meanings of these terms. I once asked a Mathematics professor: in which

branch of Mathematics he has specialized. He replied: elasticity. So the words we use in common parlance have a meaning which requires a special branch of Mathematics to be described accurately.

The progress of technology has made us change our ideas almost in every field very radically. About three decades ago it was thought that leather is the best material for shoes. But even at that time it was obvious that even one walk in rain with a leather shoe damages it permanently. Now we have synthetic material for shoes which can be washed without the necessity of drying them, is as light as cloth, as soft as rubber and so strong that you need not replace your shoes unless you are attracted by new models. So all the good qualities you want cannot only be logically analysed, they can be separated from the unwanted ones and combined with the desired ones.

What is true of raw material for shoes is true of human beings also. It is customary to talk of intelligent and non intelligent men. But the adjective intelligent is as vague as the adjective strong. Just as there are umpteen facets of strong there are umpteen facets of intelligence and a person who is found to be very intelligent in one type of intelligence test can be found to be very dull on another. While construting one type of intelligence test we can take care that it includes only those questions performance on which is not

correlated with performance on another type of test. We can construct at least 120 types of such tests. Such tests are uncorrelated with one another. That means a person who stands first in one may even stand last on another. So is there any meaning is saying that one man is more intelligent than another?

When it is said everybody should be treated as equal the statement is wrong if it is supposed that they are in fact equal. There is nothing in which two human beings are equal. But it

is wrong to say that one is superior to the other because if A stands first on test one and B stands last, there can be a test on which the position can be reversed.

Why then one man can be the idol of society whereas the other may remain unnoticed. One obvious reason is that the abilities of one are needed by society and the abilities of the other are not. even if ability is the only factor for success in life, which it is not.

The cases of intelligence and strength are different in one important respect What is strength in one context can be weakness in another. Tyres are better for wheels than iron rings because they are flexible but the axels made of rubber may bring disaster. In the case of intelligence linguistic ability may be of no use in calculations but it does not act as a hindrance

The above discussion shows how *vyapti*s and the bonds on which they are based_ change witnjhgjdjyancgjrf science. But this does not prove Charvak right. The smoke fire ^*vyapti* holdsln the common sense world though its limitations pointed out by science have to be borne in mind. The sophisticated *vyapti*s proposed by science however are also subject to revision.

Eddington says that the statement: The Sun will rise tomorrow is a probable and not a certain statement. This means that the *vyapti*: The Sun will rise tomorrow because it has risen everyday so far is based on the assumption that a meteor will not dash on the earth tonight and destroy it. Such accidents do occur in the stellar world says Bertrand Russell.So there is no finality in any

The five categories of Kanada

Kanada has postulated five fundamental entities on the basis of five sense organs. What the ear can hear is sound, what contact

can feel is sparsha, what the eye can see is roopa, what the tongue can taste is rasa and what the nose can smell is gandha

On the basis of this five basic mahabhootas have been postulated. The mahabhoota which, has all five qualities is called prithvee. This is the technical definition of prithivee. whether the clay can be called prithivee is an open question. After the first shower of rain the land emits pleasant smell, a piece of earth has taste also and children and pregnant women some times enjoy chewing it, clay has visible qualities from which it can be recognized, it can be touched and by practice it should be possible to recognize clay by touch alone. Clay can carry sound waves and snakes can judge their surroundings by feeling such waves.

Clay thus has all the five qualities and answers to the Nyaya description, but there may be other substances which are different from clay and yet have all these five qualities. This does not falsify the Nyaya definition of prithivee because if they have all these five qualities they can be called prithivee.

Now we come to aapa. This word stands for water. Pure water has no smell. But it has taste according to Nyaya but some people dispute this. The way to settle this is to taste drinking water and try to identify it as water without using any other information. I suppose I will be able to taste drinking water though I am not sure about distilled water. Some readers may retort that I should have performed the experiment before writing these lines. This may have been necessary if I were writing Psychology but here it is not necessary because the Nyaya can say it has defined aapa as having the four qualities and if water does not answer to it, it is not aapa in the Nyaya sense.

The third bhoota is teja. It does not have smell and taste but it has roopa in as much as it can be seen, and few will dispute

that it can be recognized by touch. It can produce sound as can be verified by sprinkling drops of water on fire.

Here again it maybe said that the sounds of the sudden vapourization of water are carried by waves in the air and not by fire.but it is not the air that produces the sound, it is the fire.

In any case if the dispute persists the Nyaya would say it has defined tej by the three qualities and if fire does not have them fire is not teja.

Finally, we come to aakaasha. This is very often translated as vacuum and Nyaya is proved wrong by saying that sound waves cannot be produced in vacuum.

It is fairly certain that in the case of aakasha the naya is not talking of empty space. When the jar occupies space, the space does not disappear it remains as much space as when it was not occupied, the dimensions of the jar are spatial dimensions. So akasha is not empty space. Since all the other bhootas have spatial dimensions akasha exists in and through the other four bhootas and sound waves can be created in all of them. So sound is the quality of aakasha which pervades the remaining four bhootas.

We may express this in the language of Geometry and say that the five qualities are the coordinates which serve to identify the five bhootas, Prithvee is that where all the five qualities intersect and aapa is that where only four intersect and so on until in aakasha .no two qualities intersect.

If this intersection is purely due to chance prithvee should be the rarest and aakasha should be the commonest. In the world we know, aakaasha is commonest, on the earth prithvee is rarer than water but in the solar system water is rarer than prithivee It will be interesting to find out what sort of graph answers best to the actual universe.

Gowtama enlarges the list of substances by adding four more(l) time (2) direction (3) soul and (4) mind. They are defined as follows:

Time is the name given to alterations which establish unalterable relations. First January 1940 came after 31st December 1939 is a relation which cannot be altered, but this unalterable relation was established by the position of the Sun altering at 12 o'clock midnight on 31st of December. 1939 This relation once established can never be altered.

Dik or direction is an alterable relation between unalterable terms. The expression unalterable terms do not mean anything that is not subject to change. The Sun and the moon change in their visible form when they change positions but they remain identifiable as Sun and the Moon.

aatma or soul is the eighth substance. Its existence is inferred from 1. desire 2 dislike 3 effort 4 painS pleasure and 6 cognitions. These functions and qualities are not separate; they are in consonance with each other. If that were not so these functions.

would have sometimes been in conflict. A person would have been found to desire and dislike the same thing at the same time and so on.

Secondly all these are events in time.

manas This is commonly translated as mind but as used in Nyaya it has a very restricted meaning. It stands for the span of attention. This also is an event in time.

The Nyaya regards the mind as the sixth sense. It uses the following argument for proving the existence of the mind.

The five sense organs cannot give cognition of two different objects simultaneously., A word may be so short that all its letters are visible simultaneously but we do not see the letters separately, we see the whole word at one glance, for reading

the spelling we need as many glances as the number of letters. This proves that attention acts as a whole or none for cognizing two things two successive acts of attention are necessary. This all or none activity is mind. That is the reason why the Nyaya calls the mind atomic and a sixth sense.

We saw that in the case of the five dravyas the quality defining the fifth viz sound and the fifth itself taken as dimensions of space permeates the first four and does not exist independently. It is significant to note that when the list of dravyas is expanded to nine the same holds good. The manas is atomic and all the other drayas can be treated as formed of atoms a la Kanada. The atman as a chain of memories is a series of instants which are the atoms concerned. i,e, position in space cannot be defined without points which are the required atoms, kala as time is characterized by atoms in the form of instants jaakasha as space is clearly definable in terms of point sels. Vayu occupies space and thus is defined by points, tejais is delimited by spatial dimensions and thus cannot do without points, prithvee and aapa do not need any explanations to be seen as consisting of points i.e atoms.

It should be noted that Nyaya does not recognize empty space or vacuum. This is in line with the nasadeeyasookta of the Rgveda, which says that in the beginning there was no particle and therefore no aakasha or empty space. So Nyaya views space in three different ways 1 dimensions of physical objects 2 positions and 3 directions ie. spatial relations.

The question now arises what is there beyond the earth's atmosphere? The answer which can be given in the light of modern knowlegge is: light rays. So the concept of empty space is redundant,

The Coordinates of the Universe

We can take the lead from Nyaya and make the list of coordinates more inclusive by adding some more types of

perception. In addition to the above modern Psychology adds the following :

1 Sense of Balance

Near about the ear there is a three dimensional structure which enables us to maintain our balance.

2 The experience of heat and cold

The experience of heat and cold must be distinguished from the cognition yielded by touch, the cold of malaria or even of winter is not felt by touching anything. Touch is localized The experience of heat and cold is not localized

It should be noted that these experiences are not about the external world but about ourselves So they cannot be included among cognitions.

3 The experience of pain and pleasure This may be localized if the pain caused by a thorn or a pleasure is felt in a particular place of the body as the pleasure of taste or touch.

Pressure is a sense experience which can be independent of pleasurableness or painfulness of an object.

Pleasure and pain are not cognitions. They constitute awareness of our own states.

The tenth substance is the manas or brain in terms of physiology. All the senses work through the brain.

Kanada has given a scheme of panchamahabhootas. What mahabhootas shall we get if we base our list on nine senses instead of five?

Hot and cold and pleasant and unpleasant, are properties of external objects and therefore the physiological mechanisms which give rise to these experiences can be called sense organs.

Pain

Painfulness and pleasantness also belongs to the four bhootas but it is different from all the other cognitions because it can belong to memories and imaginary objects and events. Are we then justified in calling them perceived properties? Memory of pain does not necessarily revive the pain. Revival of past pain is sometimes not accompanied by its memory.in the revival. These events may be in the unconscious. Some present experience may revive the pain but not the event which had caused it. This has been portrayed beautifully by Kalidas in Dusyanta's unconscious emotions about Shakuntala caused by the curse of Durvasa.

Pain is defined by Nyaya as that experience which is unfavourable i.e. its discontinuance is pleasurable. The estimate of time of the duration of pain is always an overestimate. Pain has an adverse effect on health and efficiency.

Non Perceptive Pain

Pain has a clear physiological basis. 'Pain prevails when only C fibers are functioning even when nerves are anaesthetized ".

Heat causes pain beyond a certain intensity, 3 degrees centigrate begins to become painfully cold and 52 degrees painfully hot, though adaptation can change this. It is known that in non pain areas of the body hot rods create only heat sensations without pain. Pain that is definitely unpleasant does not occur unless the shocks are of greater intensity and duration because painful experience is the product of summation in the central nervous system. That is why very weak pain is not particularly unpleasant, capacity to feel is a pleasure. It is for this reason that biting and pinching in lovemaking is pleasurable. Pain spots are numerous in the body but for clearly identifying them pain stimuli have to be combined with pressure stimuli.

There are numerous pain receptors in the stomach. It is well known that fear is felt in the stomach and NOT in the heart. It is the stomach that is the seat of emotions and NOT the heart.

It is well known that there are erotogenous zones on the body. They give pleasure even when they are tickled mechanically.

The above experiences of pleasure and pain cannot be called cognitive.

Emotions

The same cannot be said about pain and pleasure in emotions. Some of these are directly connected with the organs of sense. Sound can be pleasurable and painful but this pain or pleasure is not located in the ear. The pleasure is not felt in the ear, it is mental or in the language of Gowtama in the span of attention. Secondly an ear may be quite sensitive to differences of pitch and rhythm.but this does not guarantee that the person has a musical ear. So the pleasure of music is much more than the exercise of the capacity to discriminate pitch and rhythm. A person who enjoys one style of music cannot enjoy another unless he gets used to it. So sensitivity to music is quite different from sensitivity to sound.

In the case of touch smooth surfaces are pleasurable to feel. So this can be regarded as cognitive pleasure.

The World of Values

Coming to the eyes, can we say that perception of beauty is a visual pleasure? Experiments show that colour is irrelevant in the perception of beauty. That white complexion is regarded as a must for beauty in India is due to conditioning by the fact that all the conquerers of India: The Turks, Afgans Mughals and the British were white. Literature before these conquests does not show that white complexion was regarded as a must for beauty. Draupadi whose beauty drew eighteen akshowhinis to the battlefield was krshna Rama and Krishna who are

described as emblems of beauty were dark like clouds. Vijjaka a poetess of the eighth century describes herself with pride as having the complexion of a blue lotus.

Smooth and radiant surfaces are regarded as beautiful. But is it not possible that a man may be capable of recognizing a surface as smooth and radiant but may not experience any beauty in it?

In the case of taste, it is quite possible for a man to recognize how sweet or how hot an eatable is without enjoying or disliking its taste.

The same is true of smell. The smell of perfumes is regarded as pleasant. Specialists can recognize whether a bit of saffron is genuine or imitation by smell alone. But do they enjoy perfumes more than others?

So it is possible to say that though sound, touch, vision, taste and smell are perceptions the pleasure given by them is not a perception. It is an experience based on a complex processes of conditioning based on the sense organs.

This brings us to emotions. The emotions are eight, (1) Erotic (2) Heroic (3) Pathetic (4) Humour (5) Wonder (6) Anger (7) Fear (8) Nausea These are discussed at length in science of literature, the point relevant here is whether these emotions are cognitions.

These emotions are aroused by certain conditions in the real world. But those very conditions can be cognized without experiencing these particular emotions. So for experiencing these emotions mere objective conditions do not suffice. The attitude of the experiencer is also important.

Secondly some of these emotions are painful in real life but in literature all of them are pleasurable.

This statement is vehemently denied in some quarters. They urge that this view is based on the wrong assumption that man

always seeks pleasure and tries to avoid pain. But the facts against this view are conclusive. Pleasure is accompanied by contraction and pain by prolongation of time. Time does not hang on a person who is appreciating a tragic play. It contracts exactly as it does in relishing a comedy. Secondly pain affects health adversely and pleasure favourably. No body is known to have suffered ill health by enjoying tragedies. So tragedies are pleasurable experiences. Sanskrit sahityashastra accepts this unhesitatingly.

The Ethical Values

The dictum whatever is pleasurable is good is more vehemently denied in the field of Ethics than in the field of Aesthetics. In doing this the meaning of the word pleasure is unjustifiably restricted. The most disappointing example of this is RusssIP's ethics. He says that what a hungry man experiences in eating food is not pleasure, the word pleasure is applicable to the experience of a man who eats even when he is not hungry. It is difficult to agree with the statement that what I feel in eating food when I am hungry is not pleasure but if I eat a sweet even when I am not hungry I feel pleasure. I should say I enjoy eating much more when I am hungry than when I eat without being hungry.

The arguments against the thesis that whatever is pleasurable is good go to ridiculous extents. Broad says that this makes malice good. The answer is clear. Malice is not good because its effects are not pleasurable, malice is bad because it increases the pain in the world. If A is malicious towards B he will try to see that B suffers.

The usual argument against psychological hedonism is that the martyr does not act for pleasure. Here again the word pleasure is unduly restricted. The martyr does not enjoy the hanging rope but he certainly feels elated at the thought that he is dying for a cause.

Moor argues that A cannot be both good and bad but if hedonism is accepted we have to say that A can be both good and bad. This is a contradiction. If A can be both tall and short depending on with whom he is compared he can be both good and bad, good for X and bad for Y.

Moor further argues that, there will be good and bad things even if there are no sentient beings. This is a reduction ad absurdum of anti hedonism. Moor says that what is good and bad is known by intuition, and has given a list of the good things that his intuition has revealed. But if there are no conscious beings how can anyone have these intuitions? In fact, Moors's intuition simply amounts to his feeling pleasure in the contemplation of what he calls good and yet he persists in denying hedonism.

By denying that values are based on the experience of pleasure and pain the anti hedonists are ruling out all rational discussion of values aesthetic or ethical. Kant calls morality a categorical imperative. He also says that violation of this imperative is a self contradiction. Thou shall keep your promise is a categorical; imperative. Violating this implies violation of the inviolable which is a contradiction.

I can as well say "thou shalt always lie" is a categorical imperative because if you violate this it leads to the violation of the inviolable.

Again 'Thou shalt not suffer a witch to live' is also a categorical imperative. If we follow Kant obeying this should also rank as the highest of virtues.

Rational aesthetics and ethics can be based on pain and pleasure alone. But for this we have to accept the Nyaya definition of pleasure and pain viz Pleasure is a favorable experience and pain is an unfavorable experience. Favourable experience is that which shortens time, there is a desire that it

should continue and it is conducive to health. Painful experience is in all respects the reverse of this.

Ethical conduct is that which is likely to maximize this favourable experience and unethical conduct is that which tends to minimize it.

One of Broad's objections to this is that if maximizing pleasure is good then increasing the number of sentient beings in the world would be better than controlling population. I do not see the force in this argument. What is the fallacy in regarding twenty happy human beings preferable to having ten if in the process of having twenty happy human beings you are not causing misery to anyone?

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